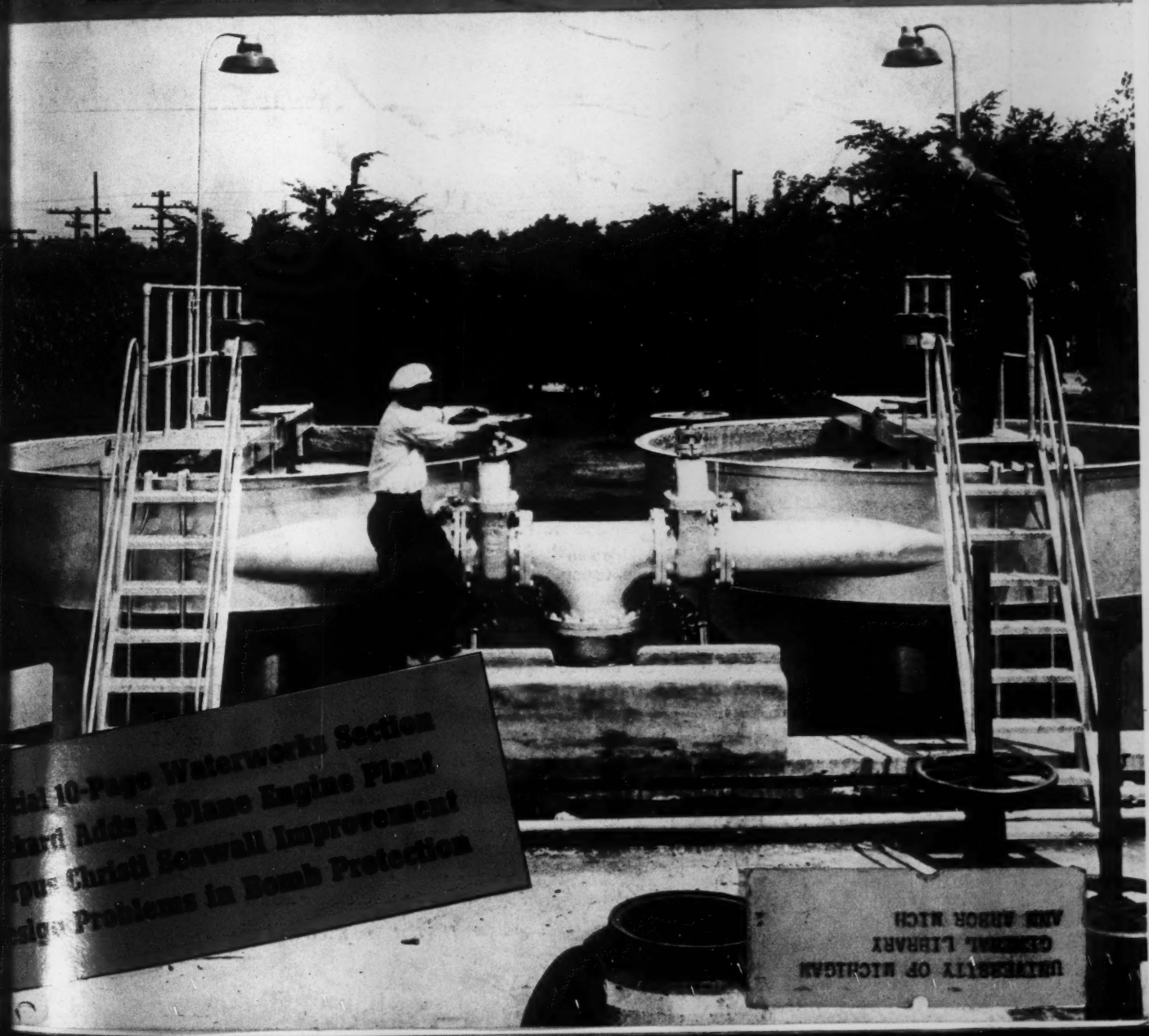
SEP 15 1941

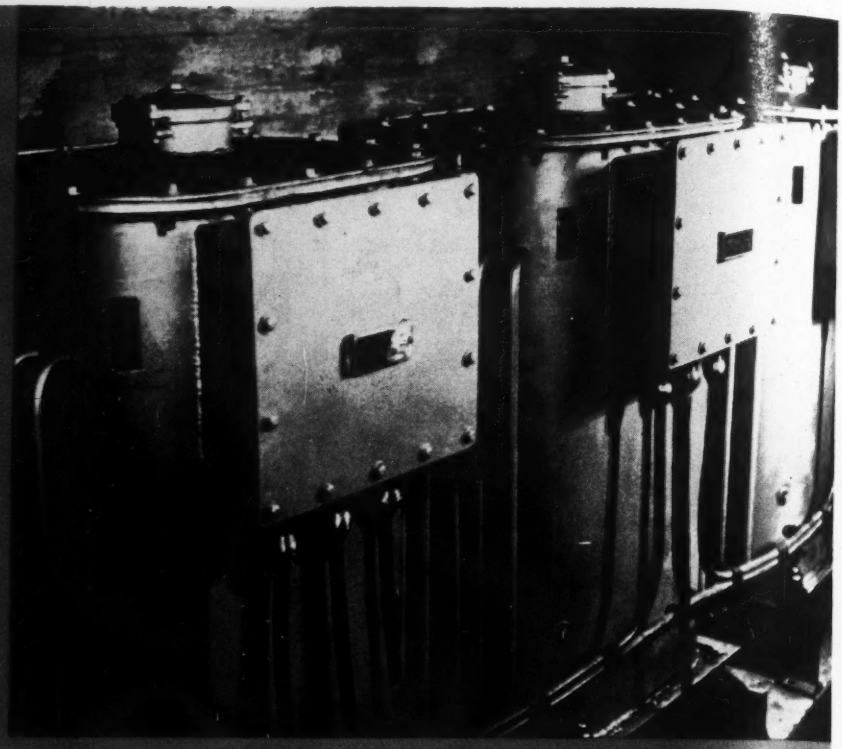
ENGINEERING NEWS-RECORD

SEPTEMBER 11, 1941

Ozone diffusers which help combat taste and odors in the Whiting, Ind. water supply.



6 years IN AN UNDERGROUND VAULT —no sign of corrosion



BYERS WROUGHT IRON

These 100 kva. subway type transformers supply all the power required to operate locks, dam gates, and traveling cranes at Mississippi River Lock and Dam No. 20, Canton, Mo. The transformers are installed in an underground vault, and so corrosion is a constant threat to the life and the dependability of the installation. As protection against premature failure, the all-welded cases were fabricated of Byers Wrought Iron 3/16" and 1/4" plates. Oil-cooling radiation tubes are also wrought iron.

Electric transforming and distributing equipment are often installed where severe corrosion is encountered, and where frequent inspection is difficult or impossible. In such cases, engineers are making extensive and successful use of wrought iron. In addition to transformer cases, it has been used in lamp standards; in switch and junction boxes which must serve in highly corrosive industrial atmospheres; and for conduit in corrosive soils, in submarine crossings, and for bridge work.

One point of particular importance today is that wrought iron does not depend on surface coatings of any kind for its corrosion-resisting qualities, and so present or possible shortages of such coatings need not worry wrought iron users. Wrought iron's corrosion resistance is the result of extremely pure base metal, through which is uniformly distributed thousands of non-rusting glass-like fibres of iron silicate.

Our Engineering Service Department has on file a large volume of data on the performance of wrought iron in hundreds of corrosive services, and will be glad to give you full details on any particular application in which you are interested. For a quick "preview" of the many places where engineers are using wrought iron in tanks of various kinds, ask for our bulletin, "Wrought Iron for Tank Construction."

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON

TUBULAR AND FLAT ROLLED PRODUCTS

STEEL TUBULAR PRODUCTS

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Highways, Streets, Dams, Foundations, Earthwork, Flood Control, Public Works, Irrigation, Canals, Railroads

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Vol. 127 SEPTEMBER 11, 1941 No. 11

THIS WEEK

• One of the most interesting waterfront developments in recent years is that at Corpus Christi, Tex., which involved the construction of a 12,000-ft. reinforced-concrete seawall, a dredged fill of 2,000,000 cu.yd. and a paved multi-lane Shoreline Boulevard, recreation piers and yacht basin. This work, which included many unusual problems, is described in this issue.

• As a follow-up of their article in the Aug. 28 issue, *Factors in Aerial Bombardment Protection*, Professors Wessman and Rose discuss structural problems in bomb protection. Special consideration is given to design of interior walls, partitions, floors and stairways. Plans of a shelter to house 1,200 persons are given.

• Waterworks engineers, operators and municipal administrators will find in the ten pages devoted to waterworks service in this issue a wealth of new information on taste and odor control, and softening practice, as well as a novel method of plugging pipe leaks with a jellifiable solution.

THINGS TO COME

• The most difficult foundation problem encountered in thirty years of practice as a foundation specialist, and how the problem was solved with drilled-in-caissons will be described by Charles B. Spencer of Spencer, White and Prentis, Inc., in the Sept. 25 issue.

• A special section will be included in the Sept. 25 issue featuring some novel developments in the field of sewage disposal that will prove of unusual value in the solution of current and future problems.

• How the Army and Navy are benefiting from the landfill system of refuse disposal employed by New York City will be described in an early issue.

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Number of copies of this issue printed: 35,794

Call Ryerson for Reinforcing Bars

● There is a shortage of reinforcing bars, like all other steel products, which means that Defense orders have first call; however, we believe the situation will be easing a bit before long.

While we have not been able to take care of all requirements, it will probably pay you to check with us whenever you need reinforcing bars, wire mesh, accessories, etc. Deliveries are always co-ordinated with the progress of the job and bars are accurately cut, bent and tagged according to blue prints and specifications. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Detroit, Buffalo, Cincinnati, Cleveland, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

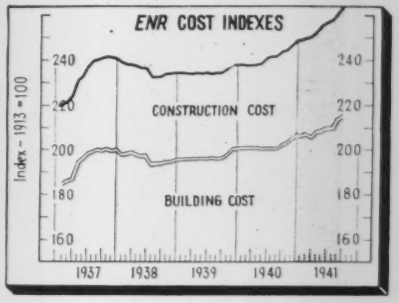
RYERSON

MONTHLY CONSTRUCTION BUSINESS SUMMARY

ENR CONSTRUCTION VOLUME AND NEW CAPITAL . . . . F H A MORTGAGES

(,000 omitted)	August 1940 (5 wk.)	August 1941 (4 wk.)	% Change†	Eight Months 1940 (35 wk.)	Eight Months 1941 (35 wk.)	% Change
Total Construction	$397,253	$529,561	+67.0	$2,134,721	$4,329,627	+103.0
Private Construction	82,766	72,982	+10.0	635,560	893,742	+41.0
Public Construction	314,487	456,579	+82.0	1,499,161	3,435,885	+129.0
Federal	170,342	376,426	+176.0	557,990	2,547,920	+357.0
Total New Productive Capital	$285,525	$396,186	+73.0	$1,985,331	$5,403,461	+172.0
Private Investment	121,162	41,857	−57.0	758,099	627,462	−17.0
Federal (non-federal work)	139,363	24,129	−78.0	418,660	378,410	−9.0
Federal (federal work)	25,000	330,200	+1,552.0	808,572	4,397,589	+443.0
FHA Mortgages Selected for Appraisal	$121,960	$120,234*	−1.5	$877,795	$1,011,891*	+15.0

† *Adjusted for difference in number of weeks.* * *Preliminary.*



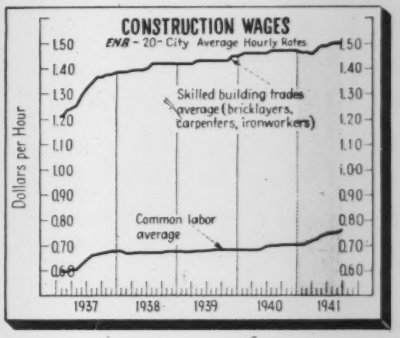
CONSTRUCTION COSTS . . . . WAGE RATES . . . . PRICES

	September 1940	September 1941	% Change	Change August to September 1940 Aug.	1940 Sept.	1940 %	1941 Aug.	1941 Sept.	1941 %
ENR Construction Cost Index, 1913 = 100	244.13	263.12	+7.8	242.18	244.13	+0.8	260.41	263.12	+1.0
ENR Building Cost Index, 1913 = 100	203.13	214.58	+5.6	201.71	203.13	+0.7	212.45	214.58	+1.0
ENR 20-CITIES' AVERAGE									
Common Labor	$0.711	$0.761	+7.0	$0.707	$0.711	+0.6	$0.753	$0.761	+1.1
Skilled Labor (Av. 3 trades)	1.480	1.516	+2.4	1.476	1.480	+0.3	1.501	1.516	+1.0
Bricklayers	1.568	1.608	+2.5	1.568	1.568	0	1.595	1.608	+0.8
Structural Ironworkers	1.542	1.582	+2.6	1.535	1.542	+0.5	1.582	1.582	0
Carpenters	1.330	1.358	+2.1	1.330	1.330	0	1.327	1.358	+2.3
Cement, per bbl.	$2.52	$2.52	0	$2.52	$2.52	0	$2.52	$2.52	0
Reinforcing steel, per cwt.	2.52	2.59	+2.8	2.49	2.52	+1.2	2.59	2.59	0
Struct. steel shapes, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
Sand, per ton	1.17	1.18	+0.9	1.17	1.17	0	1.18	1.18	0
Lumber, 2 x 4 Fir, per M ft.	35.43	44.72	+26.2	34.97	35.43	+1.3	43.05	44.72	+3.9
Lumber, 2 x 4 Pine, per Mft.	32.77	40.01‡	+22.1	31.12	32.77	+5.3	39.63	40.01‡	+1.0
Brick, common, per M	14.43	14.83	+2.8	14.35	14.43	+0.6	14.76	14.83	+0.5
Ready-mixed concrete, c.y.	6.93	7.07	+2.0	6.94	6.93	−0.1	7.07	7.07	0
Struct. clay tile, 3 x 12 x 12	74.78	75.99	+1.6	74.49	74.78	+0.4	75.01	75.99	+1.3
Paving asphalt, cars, ton	14.21	14.63	+3.0	14.20	14.21	+0.1	14.60	14.63	+0.2

‡ *Do not reflect effect of ceiling set by Price Administrator Sept. 5.*

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Sept., 1941	263.12	126.48	214.58	116.00		
Aug., 1941	260.41	125.18	212.45	114.84	434	190
July, 1941	258.18	124.11	210.22	113.64	635	278
June, 1941	256.79	123.44	209.41	113.20	492	216
May, 1941	255.55	122.84	209.24	113.11	275	121
April, 1941	252.40	121.33	208.60	112.76	322	141
Mar., 1941	250.71	120.52	207.88	112.37	386	169
Feb., 1941	250.50	120.42	208.42	112.67	374	164
Jan., 1941	249.69	120.03	207.94	112.46	402	176
Dec., 1940	249.12	119.75	208.19	112.54	344	151
Nov., 1940	247.24	118.85	206.24	111.49	331	145
Oct., 1940	245.02	117.78	204.02	110.29	490	215
Sept., 1940	244.13	117.35	203.13	109.83	324	142
Aug., 1940	242.18	116.42	201.71	109.04	281	123
1940 (Av.)	241.96	116.31	202.81	109.64	269	118
1939 (Av.)	235.51	113.21	197.44	106.73	211	92
1938 (Av.)	235.86	113.34	196.83	106.40	197	86
1937 (Av.)	234.71	112.66	196.15	106.07	172	75



MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	August 1940	August 1941	% Change	July 1941	% Change July-Aug.
Lumber (% 1935-'39 wk. seas. av.) N.L.M.A.	120.3	139.0	+15.5	129.8	+7.1
Steel (% operating capacity) A.I.S.I. (revised)	90.3	96.2	+6.5	95.9	+0.3

	July 1940	July 1941	% Change	Seven Months 1940	Seven Months 1941	% Change
Fabricated Structural Steel, tons, A.I.S.C.	127,120	187,082	+47.0	782,132	1,265,352	+61.7
Cement, thous. bbl., U. S. B. of M.	13,442	16,687	+24.1	67,216	88,331	+31.2
Building Permits, Dun & Bradstreet, (,000 omitted)	$124,498	$155,939	+25.3	$774,204	$913,521	+18.0

RENT INDEX . . . . EMPLOYMENT

	August 1940	August 1941	% Change	July 1941	% Change July-Aug.
Rent (Housing) Index, N.I.C.B.	86.9	88.6	+2.0	+88.4	+0.2
Estimated Total Employment, N.I.C.B.	*Temporarily discontinued by reporting source.*				
Est. Construction Employment, N.I.C.B.					

ENGINEERING CONSTRUCTION CONTRACTS——ENGINEERING NEWS-RECORD——AUGUST, 1941

Engineering News-Record *reports projects of the following minimum costs:—waterworks, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000

Four Weeks—Thousands of Dollars (000 Omitted)

Public Works	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States August 1941	United States Eight Months 1941	United States Eight Months 1940	Canada
Waterworks	115	888	540	358	2,933	577	5,411	55,299	53,780	300
Sewerage	28	1,153	397	916	685	693	3,872	64,255	59,375	160
Bridges, public	971	683	2,933	1,196	1,711	386	7,880	79,090	73,725	30
Earthwork and waterways	351	1,173	3,352	2,789	571	18,124	26,360	203,961	183,343	860
Streets and roads	3,179	7,639	11,350	8,217	14,205	6,499	51,089	427,634	476,648	2,160
Buildings, public	24,349	38,521	59,398	40,085	128,987	9,428	300,768	1,994,332	394,304	3,292
Unclassified, public	11,853	3,612	32,198	495	7,164	5,877	61,199	611,314	257,986	7,274
Total public	**40,846**	**53,669**	**110,168**	**54,056**	**156,256**	**41,584**	**456,579**	**3,435,885**	**1,499,161**	**14,076**
Federal government (included in above classifications)	36,148	31,377	96,706	43,076	136,580	32,539	**376,426**	**2,547,920**	557,990	.....
Private										
Bridges, private	.....	.....	.....	.....	.....	.....	.....	5,360	10,190	.....
Buildings, industrial	1,696	6,996	1,651	5,205	3,201	1,950	20,699	355,774	284,287	4,881
Buildings, commercial	2,710	15,598	1,032	2,822	8,414	3,025	33,601	373,592	250,603	651
Unclassified, private	150	1,132	3,286	2,128	9,803	2,183	18,682	159,016	90,480	450
Total private	**4,556**	**23,726**	**5,969**	**10,155**	**21,418**	**7,158**	**72,982**	**893,742**	**635,560**	**5,982**
Total Engineering Construction:										
August, 1941 (4 weeks)	**45,402**	**77,395**	**116,137**	**64,211**	**177,674**	**48,742**	**529,561**	.....	.....	**20,058**
July, 1941 (5 weeks)	21,838	162,387	262,030	75,217	283,111	154,080	**958,663**	.....	.....	52,175
August, 1940 (5 weeks)	23,260	85,585	105,578	73,491	61,631	47,708	**397,253**	.....	.....	44,768
Eight Months—1941	**231,625**	**886,852**	**989,990**	**676,201**	**980,490**	**564,469**	.....	**4,329,627**	.....	**175,326**
Eight Months—1940	137,032	505,912	471,653	379,674	376,322	264,128	.....	.....	2,134,721	157,752

Busy Signal AT MURRAY HILL

One wing of the Bell Telephone Laboratories Bldg., Murray Hill, N. J. *Contractor:* John Lowry, Inc., N.Y.C.; *Sub-Contractor on Concrete:* George Peterson, Inc., Harrison, N. J. *Architect:* Voorhees, Walker, Foley, and Smith, N. Y. C.

By putting in a call for Atlas High-Early cement, contractor cut time for concrete work 33%, and slashed protection, curing, form, salamander, and tarpaulin costs.

UNFORESEEN DELAYS prevented completion of the concrete work on this building during the summer. To speed construction economically during cold weather, it was decided to switch from Atlas portland cement to Atlas High-Early cement.

Did it pay? Here's what the contractor reported:

TIME SAVED on each placement of concrete due to earlier stripping of forms amounted to 2 or 3 days, thus completion of concrete work was speeded at least 33%.

FORM COSTS CUT—High-speed construction was essential. If normal portland cement had been used and the same time schedule for placing concrete followed, another 20,000 ft. of lumber and another 20,000 ft. of plywood would have been required for forms.

PROTECTION AND CURING COSTS CUT—Depending on the temperature, 2 or 3 days were saved in protecting and curing each placement of concrete. This resulted in a large saving in fuel and labor costs, for as many as 40 salamanders were operating at one time. Further, more salamanders would have been necessary with normal portland cement as it would have been impossible to release salamanders for new work as quickly.

Also, $5,000 in tarpaulins were used to inclose the structure. Another $1,000 in tarpaulins would have been necessary if normal portland cement had been used.

TEMPERATURES—This speed and economy were realized in winter weather. There were only 4 days in two months when temperatures did not fall below freezing.

Atlas High-Early cement more than pays for its slightly higher cost on many jobs. It will pay you to consider it on your next job. Universal Atlas Cement Co. (United States Steel Corp. Subsidiary.)

OFFICES: *New York, Chicago, Phila., Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

NR-11-36

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

Priority rating plan for road work now effective

New procedure, which covers mainly state work, gives preference to access roads, two Panama highways, and strategic-network projects.

A special procedure by which state highway departments may obtain priority ratings on needed equipment and materials was put into effect this week. As predicted, it puts the job of passing on applications up to the Public Roads Administration. Forms have been furnished to the states on which they may make a consolidated application for ratings on all the defense road projects they have under way or on which plans and estimates have been prepared.

The application will be passed upon by the local PRA engineers and transmitted to the Washington office of PRA. When approved by PRA, the application will be handed over to OPM's Priority Division for issuance of a project rating. It is expected that in nearly all cases PRA recommendations will be accepted as final and that this last step will be a mere formality.

Procedure to get ratings

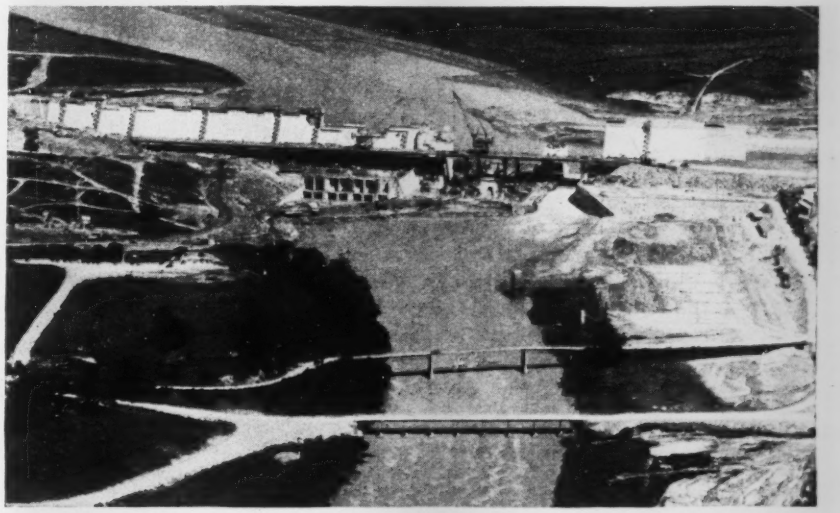
The rating to be issued will be a regular P-19 project rating, of the type which has been used the last couple of months for construction work. It will apply to all purchases, for the particular project, of needed equipment and materials which are included in the current Priorities Critical List. The rating will in all cases be issued to the highway department. Where the highway contractor is doing the buying, he must send two copies of his purchase order to the highway department. The department will keep one and forward the other to the supplier together with a copy of the project rating. On later orders it is only necessary to refer to the serial number of the particular project rating.

The new plan covers mainly state road work. Municipalities doing defense highway jobs and wanting priority ratings must still make a separate application for each project direct to the Project Rating Section, Priorities Division, OPM. This application should take the form of a letter setting forth a detailed description of the work, the materials needed and suppliers being used, and the defense or civilian importance of the job. Even in this case, however, the assistance of PRA district engineers may be enlisted as intermediaries in obtaining priorities.

The particular rating to be given to highway jobs depends on the type of work. Highest rating, A-1-b, is granted to two roads in Panama—the Trans-Isthmian and Chorrera-Rio Hato highways. Access roads in general get high ratings, and defense status—A-10 or higher—goes to all major work on federally-aided roads.

Access roads into Army or Navy airbases get a rating of A-1-e, those into other military reservations, A-1-j. Access roads into manufacturing plants get a rating corresponding to that of the plant served, except that it may not be higher than A-1-e.

Bridges, tunnels, structures other than grade separations, and the corresponding approaches get a rating of A-2 if they are located on the strategic network. A-3 if



Cherokee Dam after one year of construction

When this picture was taken Aug. 1, it showed one year's accomplishment on Cherokee Dam, under construction by the Tennessee Valley Authority on the Holston River 30 miles Northeast of Knoxville, Tenn. The dam was authorized for construction in an emergency measure signed by President Roosevelt on July 31, 1940 and work started next day. About 700,000 yd. of concrete have now been placed for the 175-ft. high, 1689-ft. long concrete section of the dam, which will require about 770,000 yd.

The concrete section will be flanked by a rolled fill requiring 3,500,000 yd. of earth and 200,000 yd. of riprap to make the dam's total length of 6,719 ft. The structure is expected to be far enough along to permit storage of water in December.

Power equipment installation has started and the first of three 30,000-kw. units is scheduled to go into operation in the spring of 1942 to provide added electricity for aluminum production. Erection of the powerhouse structural steel is underway.

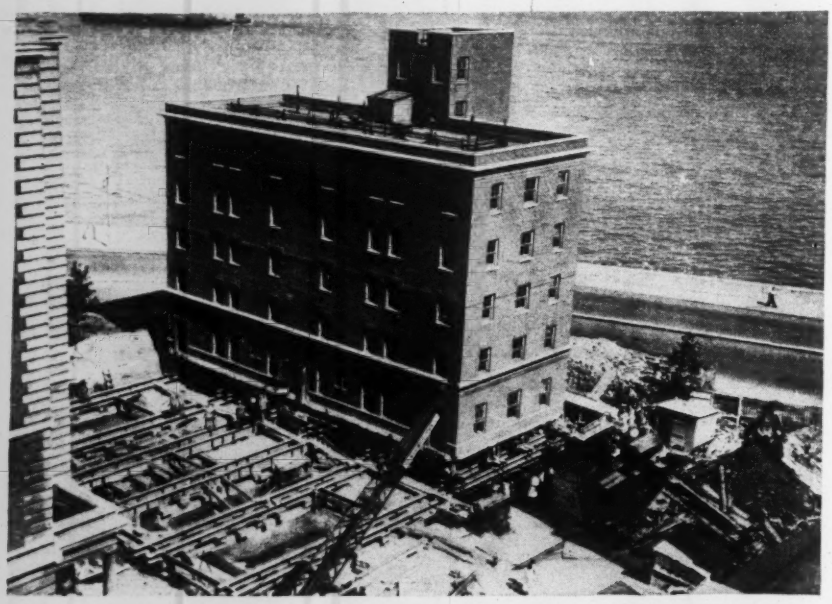
Construction of the dam is being done by TVA's own forces. Lee G. Warren is project manager, G. E. Murphy construction superintendent and T. F. Taylor construction engineer.

on the primary federal-aid system, and A-7 if on secondary federal-aid, park or forest roads. Grade separations, new roads, or improvements to substandard roads get A-4 on the network, A-7 on the primary system, and A-10 on the secondary. Shoulder widening and minor drainage structures rate A-10 if on the network or the primary system. Other federally aided work gets the meaningless rating of B-3.

A priority rating of A-10 has been attached to orders for materials needed for the repair of highways by state or local agencies. To use this rating the purchasing agency does not need to make any application or go through any red tape but needs only to indicate on the order that it is for highway repair and is entitled to such a rating.

Work on the Inter-American highway gets a rating of A-3.

Significance of these ratings depends on the material being bought. As to steel, which is the chief highway department worry, it is a safe assumption that a rating of A-3 or higher offers assurance of reasonably prompt deliveries except perhaps on plate. In many cases any A rating is sufficient.



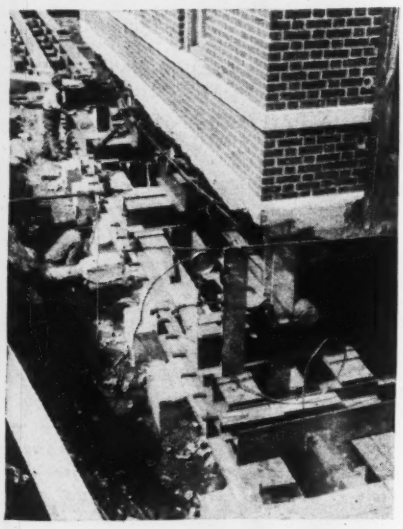
Wide World Photo

Engineers operate on New York hospital

Construction of New York's East River Drive required the removal of a 5-story, 2,300-ton steel-frame, brick-wall hospital building at 15th Street and East River in lower Manhattan. The original plans contemplated demolition and new construction but it was found that the 80x30 ft. building could be moved and reconditioned at far less than the cost of a new structure.

The steel frame has 26 columns, and as the first operation in the moving work cross members were welded to opposite sides of these columns. Next the building was lifted vertically a total of 13 in. by use of 52 hydraulic jacks, and this was followed by placing heavy steel beams for a track and as supports to carry the building. Steel rollers were then inserted between the track and building support beams. Finally six hydraulic jacks were used to push the building 10 in. at a time the total distance of 60 ft. to its new foundations, which was prepared in advance. Actual moving operations required a little more than 8 hr.

Preparing the new foundations and moving the structure was done by Spencer, White & Prentis, Inc. of New York City under a $49,500 contract with the office of the President of the Borough of Manhattan. For the contractor Jos. C. Weaver was general superintendent, Mike Canale was job superintendent and Geo. Flay was job engineer.



WASHINGTON HIGHLIGHTS

ON SEPT 9 the Supply Priorities and Allocation Board refused to grant priorities for the steel required for the proposed double 20 to 22 in. diameter oil pipeline from the Texas oil fields to the New Jersey refineries. The line is intended to replace tankers diverted to the British from the East Coast oil trade. The project, it is estimated, would use 750,000 tons of steel—most of it plate, which is urgently needed for the ship program. Construction of the line is supported by Oil Coordinator Ickes and Director of Civilian Allocation Henderson, but it is vigorously opposed by the Navy and the Maritime Commission. It is being argued that the East Coast can be provided with oil either by means of railroad tank cars or by the concrete oil barges which the Commission intends to build, thus making the pipeline unnecessary.

BECAUSE of difficulties in buying construction equipment, the Bureau of Reclamation last week bought used equipment for the first time. The Bureau bought two used power shovels and three tractors for use at the Altus project in Oklahoma.

MAJ. GEN. JULIAN L. SCHLEY, chief of engineers, will retire from active service Sept. 30. General Schley, now on leave of absence, is 61 and has been in military service for 42 years. As previously announced (*ENR* Aug. 21, 1941, p. 261), General Schley will be succeeded as chief of engineers by Brig. Gen. Eugene Reybold.

THE WAR DEPARTMENT has definitely abandoned its grandiose plan for a record-size office building, housing 40,000 people, to be located near Arlington Cemetery across the Potomac River from Washington. The project, for which Congress appropriated $35,000,000, was killed by Presidential disapproval. Plans for an alternative design of half the size and located at another spot in suburban Virginia are now being worked out under the personal supervision of the President.

Apparently at Presidential suggestion, tentative plans call for an experiment with windowless construction. One section of the building, 175 ft. square, will rely entirely on artificial light and air conditioning. Remainder of the building will be divided in conventional fashion into fourteen wings.

Intention, it is understood, is to push ahead meanwhile with the completion of the permanent War Department building in Washington proper, the first section of which is already in use.

Northern Wisconsin swept by floods of unusual intensity

Numerous utility systems put out of service as many dams, highways, and railroads are damaged.

Following ten days of steady rain, a deluge on Aug. 30 in the lake resort region of northern Wisconsin put streams out of their banks, damaged roads and railroads, took out several power dams, inundated numerous towns and inconvenienced thousands of Labor Day weekend visitors. The storm of Aug. 30 registered 15 in. of rainfall at Hayward, and from 7 to 12 in. at other points in the vicinity. Streams affected most were the Wisconsin, Chippewa, White, Bad and Nanakagan Rivers. The White and Bad flow north into Lake Superior near Ashland, the others drain southwest into the Mississippi Basin.

Continued rain last week kept the streams high and made inspection of damage difficult. The crest on the Wisconsin is moving slowly, reaching Portage on Sept. 6. It may take another week to reach the Mississippi. The flood swept down the Chippewa at a faster rate, causing considerable damage at Eau Claire and Durand.

Drainage is poor in the upper reaches of the streams, in the flat North Woods and Lakes region. Here the waters spread out to close almost every highway for a short time at least, although damage to state routes is reported as light. County roads are apparently damaged much more, but complete reports are slow in coming through. Heaviest loss on the state highway system is that of a long concrete slab and wood pile trestle over Fish Creek east of Ashland. Three other main bridges are out of service, but reports indicate they are not seriously damaged.

The main line of the Soo R.R. traverses the south end of the flood area, and some trouble was experienced along this route. The Northwestern and the Milwaukee railroads, which serve the northern part of the state, report damage to branch lines only, in some instances considerable stretches of track being washed out.

Private property suffered from inundation, especially in Eau Claire, Wausau, Durand and Hayward. At Brokaw, on the Wisconsin River, a large paper mill was wrecked when the front wall of the plant was undermined. Several small utility systems were put out of service by failure of their power dams. Dams of some of the larger systems were damaged, but service was maintained through inter-system hookups. At Jim Falls, near Chippewa Falls, the Northern States Power Co. lost part of an earth dike at the power dam, a gate pier, and suffered inundation of the powerhouse. The company's Chippewa

(*Continued on p. 67*)

Wayne Bell Photo

Jim Falls Dam dynamited to save power plant

A section of the earthfill dam at the west end of Jim Falls Dam on the Chippewa River a few miles above Chippewa Falls, Wis., was dynamited during the recent flood in that river in order to save the power plant from damage due to overtopping of the intake works.

Jim Falls Dam was completed in 1924. It consists of 430 ft. of low earth fill with concrete core wall at the west end (right), 209 ft. of concrete spillway dam surmounted by 4-ft. flash boards designed to collapse when overtopped in a flood, a controlled spillway with 16 tainter gates 16 x 13 ft. deep, and 1,300 ft. of earthfill with a concrete core. Beyond the east end an intake canal, partly in cut and partly behind dikes, extends to the headgate structure. The latter, which has a freeboard of 6 ft. above normal headwater elevation, is equipped with a surge spillway 40 ft. wide.

Details of the extent of the flood at the dam are lacking. When the dam was built, spring floods were estimated at from 30,000 to 40,000 cfs.

See above for more details.

Pennsylvania work relief agency now operating

The newly created state work relief administration of Pennsylvania began operation Aug. 25 with H. R. Davidson, formerly of the Pennsylvania state highway department, as administrator. Work under this agency may be sponsored by any municipal government or by divisions of the state government. Cities, boroughs, and townships may be sponsors of municipal projects of any type utilizing relief labor, although road building is expected to be the major part of the agency's work. Both rural and urban projects will be considered.

Sponsors of jobs will initially supply all costs, including payment of relief labor at prevailing rates. Workers, or as many as possible for a given job, will be recruited from relief rolls through the state department of public assistance. The sponsor of a project will receive from the public assistance department one-half the amount of money each relief client employed on the job would have received on relief.

All machinery and equipment, as well as material, will be furnished by the sponsors. In practice the sponsor will also furnish the labor, but receive the assistance rebate mentioned above. The other half of the money normally paid the laborers in the form of relief funds remains in the public assistance fund. Thus relief costs are cut in half when persons are taken from relief rolls and placed in jobs under the work relief administration.

A total of $25,000,000 has been made available to the agency for road work. This grant will be handled through the state highway department, which will sponsor projects of this amount during the next two years.

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Dalstrom retires as Northwestern bridge chief

O. F. Dalstrom, engineer of bridges for the Northwestern Ry. at Chicago for the past 24 years, retired Sept. 1 at the age of 70. He is succeeded by A. E. Bechtelheimer, former assistant engineer of bridges. A. R. Harris moves up into the latter position. Mr. Dalstrom started with the Northwestern 35 years ago as a draftsman in the bridge department, and became chief of the department in March, 1917. Notable structures built under his direction include the Mississippi River crossings at Clinton, Iowa, and Winona, Minn., and the Missouri River bridge at Blair, Nebr.

Mr. Bechtelheimer joined the railroad in 1905 as a chairman on construction work. He later became general bridge inspector, and was appointed assistant chief engineer of bridges in 1928. He is 60 years old.

JOBS OF THE WEEK

DAMS, POWERHOUSES, TRANSMISSION LINES, Michigan

Wisconsin-Michigan Power Co., Appleton, Wis., will construct two dams, two powerhouses, and two transmission lines as part of the Peavy Falls Dam project on the Michigamme River. Tunnel excavation and concrete lining, and clearing site and other work has been awarded to the Bacco Construction Co., Iron Mountain, Mich., and the balance of the work to C. R. Meyer & Sons Co., Oshkosh, Wis. Total estimated cost of the project is $1,250,000. Holland, Ackerman & Holland, Chicago, Ill., are engineers for the undertaking.

DEFENSE HOUSING, Bridgeport, Conn.

James T. Brady & Co., Inc., New York, N. Y., has been awarded a $1,527,000 contract by the Division of Defense Housing, Federal Works Agency, Fairfield, Conn., for constructing the Success Park national defense housing project. Harry G. Lindsay, Bridgeport, Conn., is architect for the work.

ANHYDROUS AMMONIA PLANT, Louisiana, Mo.

Bechtel-McCone, Parsons Corp., Los Angeles, Calif., will construct an anhydrous ammonia plant for the War Department, Washington, D. C., under terms of a $16,750,000 contract awarded on a cost-plus-fixed-fee basis.

HOUSING, Baltimore, Md.

When the Public Buildings Administration, Washington, D. C., opened bids for the construction of 697 housing units for aircraft workers, the Cauldwell-Wingate Co., New York, N. Y., was low bidder with a bid of $3,383,000.

SAN VINCENTE DAM, San Diego, Calif.

City of San Diego awarded a $1,743,908 contract to L. E. Dixon Co., Los Angeles, Calif., for constructing San Vincente Dam. A $672,848 contract has been awarded to Southwestern Portland Cement Co., Los Angeles, for supplying the cement. F. D. Pyle, hydraulic engineer, San Diego, is in charge of the work.

HYDROELECTRIC PROJECT, Knowlton, Wis.

Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis., will construct a hydroelectric project. The work, estimated to cost $1,500,000, includes a power plant, a dam and transmission lines on the Wisconsin River, near the Portage-Marathon county line. George W. Condon Co., Omaha, Neb., has been awarded a contract for 345,000 cu.yd. fill; James Lefel & Co., Springfield, Ohio, will furnish the turbines, and General Electric Co., Schenectady, N. Y., will supply the generators. William F. Thiele is chief engineer for the work. M. V. Molesberry is engineer for equipment, and Thomas Utegard is in charge of construction.

DEFENSE HOUSING, Euclid, Ohio

Schirmer-Peterson Co., Cleveland, Ohio, was low bidder for constructing a defense housing project, including an administration building, for the U. S. Housing Authority, Washington, D. C. Estimated cost of the work is $2,000,000. Robert Dickerson, Cleveland, Ohio, is architect for the work.

LOADING PLANT, Carbondale, Ill.

Sherwin-Williams Co., Cleveland, Ohio, will construct a shell- and bomb-loading plant for the War Department, Washington, D. C. Estimated cost of the project is $27,000,000. S. A. Healy, Chicago, Ill., and M. J. Boyle & Co., Chicago, are contractors for the work and Giffels & Vallet, Detroit, Mich., are engineers. This item corrects an item last week when the name of the contractor was incorrect. Charles W. Cole & Sons, South Bend, Ind., received engineering and architectural contracts.

SHIPWAYS, Richmond, Calif.

Richmond Shipbuilding Corp., Richmond, will build, at an estimated cost of $3,000,000, three shipways, including shops, equipment and machinery, for the U. S. Maritime Commission, Washington, D. C.

STEEL TOWERS, Washington

American Bridge Co., Pittsburgh, Pa., has been awarded a $1,400,378 contract for construction of steel towers for the Grand Coulee-Midway, Midway-North Bonneville and North Bonneville-Vancouver transmission lines for the Bonneville Power Administration, Portland, Ore.

MAGNESIUM PLANT, Nevada

Basic Magnesium, Inc., Cleveland, Ohio, awarded the contract for constructing a $63,000,000 magnesium plant, including buildings and utilities, to McNeil Construction Co., Los Angeles, Calif. The Defense Plant Corp., Washington, D. C., will finance the project which is for the War Department. The site has not been chosen.

ASSEMBLY PLANT, Renton, Wash.

Austin Co., Cleveland, Ohio, has been awarded contract for a 900x1,100 ft. warehouse, an office building, a boiler house, and paint shops for a seaplane base for the Boeing Aircraft Co., Seattle, Wash. Estimated cost of the work is $10,000,000. The Defense Plant Corp. will finance the undertaking.

NOTE—Additional bidding and contract news on over 800 projects large and small appear in the Construction News section beginning on page 169.

Texas legislature considers road bond assumption law

Governor Stevenson of Texas has called a special session of the Texas legislature to enact a law providing for the state to continue paying principal and interest on bonds voted by counties to construct roads that are to become part of that state's highway system. The 1932 state legislature passed a law setting aside one cent of the state's gasoline tax to pay the principal and interest on outstanding bonds that had been voted by counties and road districts to assist in financing state highway construction.

During the first years the bond assumption plan was in effect, the income from one cent of the gas tax was not sufficient to make full payment on all the bonds maturing annually and the counties were required to make up the difference. Later, when the income from one cent became more than sufficient to meet current maturities, a plan was developed whereby the state went back and made arrangements for full reimbursement to the counties from the date of the original act. As the bonds were retired a surplus above the amount needed to meet principal and interest payments accrued and became the issue for an extended legislative struggle.

At the regular session of the Texas legislature which convened in January of this year a determined fight was made to continue diverting the surplus to the counties. However, such a bill was rejected by the Senate, which passed a bill to return the surplus to the state highway fund for construction of main highways. As a result no bond assumption law was passed, placing the fiscal affairs of many counties in the state in a precarious position.

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Building Stabilization Board members appointed

Associate Director General Hillman of the Office of Production Management, Washington, D. C., has announced the appointment of three members for the Building Trade Stabilization Board of Review, which was established by the July 24 agreement between the federal government and the building and construction trade unions of the American Federation of Labor. John Coyne, president of AFL's building and construction unions, has been designated by that organization. James P. Mitchell, chief of labor relations of the construction division, Office of the Quartermaster General, is to represent the various government agencies and J. Douglas Brown, chief of OPM's labor priorities section, was designated by OPM.

The board's function is to adjust labor disputes arising on defense work.

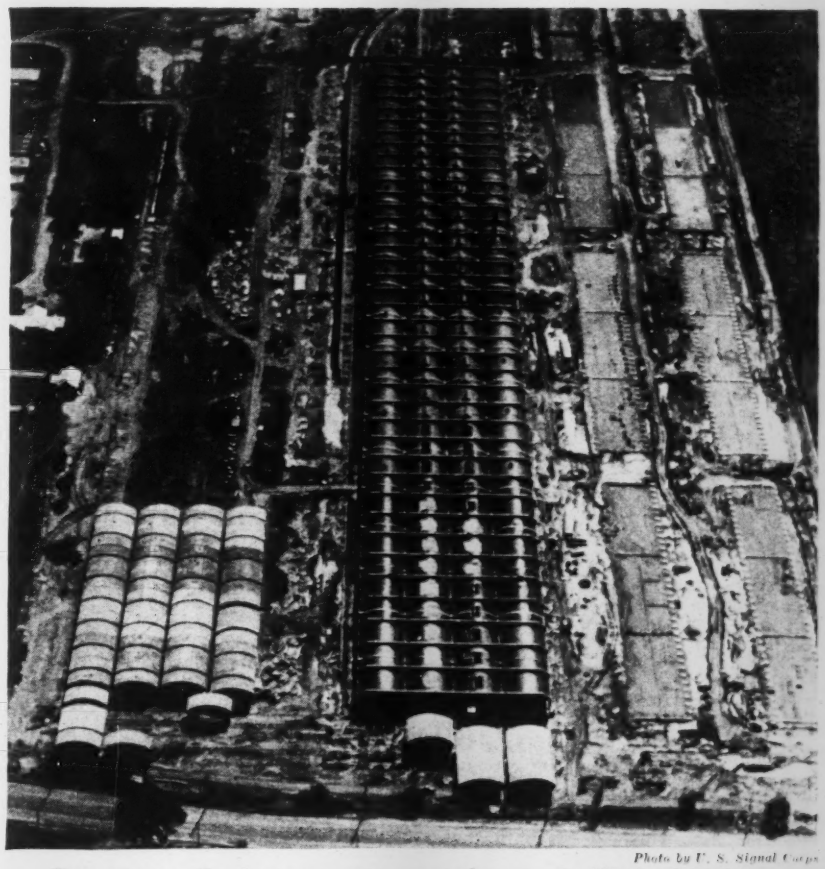

Photo by U. S. Signal Corps

Quarter-mile long army warehouse built in 36 days

Completion of the concrete roof and framing for the fourth new warehouse to be built at the Columbus (Ohio) General Depot, was accomplished in 36 calendar days with the contractor's force working on a five-day week schedule and with several rainy days and holidays intervening. The warehouse is 182 ft. wide and 1,562 ft. long. In design and method of construction it is similar to the other warehouses for the same depot described in Engineering News-Record *April 24, 1941, p. 596. It is on a site about one-half mile distant from the other warehouses and was built by the same contractor and with the same equipment used for their construction.*

The roof and frame are of reinforced concrete built to a patented "Z-D system" design, the roof consisting of four intersecting cylindrical barrel arches 45 ft. wide each with a 40-ft. span between supporting concrete cross girders above the roof. These cross girders, the roof and the ten supporting columns for each 80-ft. long section into which the building is divided are poured monolithically.

For construction of the fourth warehouse, five of the six sets of movable forms used on the first three buildings were used, each 80x182-ft. section being used four times. Use of high-early-strength concrete enabled the contractor to lower the forms and advance them two days after the pour.

The first pour on the fourth warehouse was made on June 18 and the last pour on July 23. A contract for a fifth warehouse, to be built on the area where the movable forms are shown stored in the accompanying air view, was let recently to the same contractor and work on that is now in progress.

The general contract is being performed by the Corbetta Construction Co., New York. Designs for the warehouses were prepared by Roberts and Schaefer Co., Chicago, licensees of the Z-D roof system. The warehouses are being built under the supervision of Lt. Col. A. F. Dershimer, Constructing Quartermaster at the Columbus General Depot.

Sewage equipment show to feature convention

The second annual convention of the Federation of Sewage Works Associations, parent body of the various state and sectional sewage works groups, will feature an equipment show displaying the newest developments in the sewerage and sewage treatment field. The annual exhibit will be held in the Hotel Pennsylvania, New York, convention headquarters for the Oct. 9-11 convention. The Water and Sewage Works Manufacturers Association in cooperation with the Federation is arranging this show.

U. S. Engineers plan Quartermaster work

Consolidation of two services may result in more decentralization of defense construction work.

Details on the proposed transfer of Quartermaster Corps construction activities to the Corps of Engineers are not yet available, and will not be until hearings begin the later part of this month on legislation to effect the transfer. However, well-informed speculation in Washington indicates that Quartermaster Corps construction division will not simply be moved over intact to the U. S. Engineers. Rather, it will be broken up and its functions parceled out among the divisions and districts of the Engineer Corps. It is perhaps possible that the construction division will be held together long enough to complete existing contracts, but sooner or later it seems highly probably that nearly all work will be absorbed into the Engineer Corps organization.

Civilian personnel of the construction division, under terms of the legislation introduced last week, would be transferred automatically to the jurisdiction of the Chief of Engineers. Many of the Quartermaster officers will doubtless have to be transferred to help staff the U. S. Engineers whose construction load will be about doubled. As a result of the reorganization early this year, when Gen. Somervell was appointed head of the construction division, most of the top personnel in the division are already engineer officers.

New divisions or districts likely

Internal structure of the Engineer Corps itself will undoubtedly go through some reorganization as a result of its new duties. The divisional set-up has always been rather flexible; when the Corps took over airfield construction last year the divisions were re-shuffled to fit the new construction program. The projected change will modify the divisions even farther from their original groupings along the river basins.

Because the new work involves a great deal of building construction, of which the U. S. Engineers have hitherto done little, it may be that some new sections will be formed in the corps, cutting across the divisional structure.

The pending reorganization may greatly effect contractors specializing in War Department work. Initally it is bound to cause a certain amount of confusion. As things become stabilized it will probably result in further decentralization and fewer trips to Washington. When Gen. Somervell took over the Quartermaster Corps construction, he made decentralization a major objective, but so far it has only got to the point of dividing the country into nine zones corresponding to the Corps Areas.

The U. S. Engineer structure of divisions and districts goes much farther down than this, and traditionally, the local officers have had a much greater degree of autonomy in award and supervision of contracts than has yet been accorded to zone officers of the Quartermaster Corps.

Little doubt is felt in Washington that the reorganization will be approved by Congress. It has been endorsed by the War Department and the House and Senate military affairs committees, conforms to recommendations of the Truman committee investigating defense, and presumably has the support of the administration.

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Philadelphia sewer rents again held illegal

On Sept. 4 a judge of the Philadelphia common pleas court ruled that the proposed new sewer service or rental plan for that city was primarily a real estate tax and thus illegal. The plan, calling for a $42,000,000 bond issue to finance sewage disposal improvements, consisted of two parts: (1) a levy of 30 c. per $100 of the real estate assessment, which was the part held invalid by last week's ruling; and (2) a service charge equal to one-fourth the water charge levied against the property owners. The court ruled that this latter charge was insufficient to provide carrying charges on the proposed bond issue.

Three chances remain to salvage the sewage works improvement program. They are: An appeal to the Pennsylvania State Supreme Court with the possibility of obtaining a favorable decision; reestablishment of the Philadelphia Authority, which has been kept alive, but is not active; and creation of another sewer service charge program. If the supreme court in time sustains the service charge plan just held illegal, the proposed $42,000,000 program will be submitted to Philadelphia citizens at a November election.

Any extended delay in the improvement program is likely to bring the city into controversy with the State of Pennsylvania over the city's 1923 pledge to spend $3,000,000 yearly to complete its sewage disposal system and thus end pollution of the Delaware River. The city is now 11 years and some $33,000,000 in arrears on that pledge.

A similar rental plan was declared unconstitutional by the Pennsylvania State Supreme Court Oct. 7, 1940 (*ENR* Oct. 17, 1940, p. 508), following a favorable decision in the Philadelphia common pleas court in September of that year (*ENR* Sept. 5, 1940, p. 315). This plan called for a levy of 40 c. per $100 of real estate assessment.

New malaria mosquito found at Trinidad base

A mosquito that breeds in air plants at the top of trees in Trinidad is capable of transmitting malaria, according to U. S. Army medical officers who are now devising entirely new methods of control at the national defense base there.

The discovery that this mosquito—*Anopheles bellator*—transmits malaria is hailed as a significant contribution to preventive medicine. Inauguration of control measures poses a problem in public health and economics, however, because the trees which harbor the insects provide the shade and shelter required for cocoa cultivation. Among control methods receiving consideration are those providing that the air plants—which hold rainwater required for breeding—be removed from the trees. Another method is to cut down these sheltering trees, a step which might endanger production of cocoa.

PRIORITIES GUIDEPOST

Current notes on what, who and how

STEEL USERS who ordinarily buy from warehouses will get a lift as a result of an OPM order granting a rating of A-9 to deliveries of steel to warehouses. The rating is limited to a percentage of the deliveries made to the warehouse during the first quarter of 1941. Until Oct. 5 the percentage is one-third.

JUST BEFORE they went into effect on Sept. 5, price ceilings on southern pine lumber were raised somewhat by the Office of Price Administration. Change was made by having the established prices (*ENR*, Aug. 21, p. 9) apply to rough green lumber and permitting the addition of various stated charges for kiln or air drying, facing, grooving, and the like. Some detailed changes in the schedule were also made. The change resulted from protests by smaller lumbermers that they could not operate profitably at the originally established prices.

BECAUSE of the importance of scientific research to the defense program and the public at large, research laboratories may use the high defense priority rating of A-2 to secure necessary equipment, according to an order signed by E. R. Stettinius, Jr., director of priorities. A laboratory experiencing difficulty in securing essential materials, and wishing to qualify for the A-2 rating, should apply to the chemical branch, Office of Production Management, Washington, D. C. on Form PD-88.

Northern Wisconsin swept by floods

(*Continued from p. 63*)

Falls plant was shut down because of loss of head as the tailwater rose, and settlement of a substation snapped high-tension connections.

High tailwater shut down the power plant of the Eau Claire Dells Improvement Co., near Eau Claire, and drowned out the generators. The Lake Superior District Power Co., Ashland, lost a dike and the operator's residence at its Lower Mellon Dam, and part of the earth fill at Hayward Dam, but saved its White River Dam by sandbagging. Above Wausau the Wisconsin Valley Improvement Co. lost its Spirit Reservoir and some earth fill on the Spirit River. Part of a timber crib dam of the Wausau Paper Mills at Brokaw was swept away and caused the undermining of the mill previously mentioned.

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Road congress to study Pan American problems

When the fourth Pan American Highway Congress convenes at Mexico City for its Sept. 14 to 25 meeting, special emphasis will be given topics affecting the highway as an integral part of the hemispheric defense program.

President Roosevelt has named a large group as the delegation for the United States, including Senator Josh Lee; Representatives Wilburn Cartwright, Luther A. Johnson, and Jesse F. Wolcott; Edwin W. James, chief of the division of highway transport, Public Roads Administration; William F. Machold, Office for Emergency Management; Hal G. Sours, president, American Road Builders' Association; and J. S. Williamson, president, American Association of State Highway Officials. Technical advisers appointed by the President include: John Abbink, publisher of *Engineering News-Record*; Roy W. Crum, director, Highway Research Board, National Research Council; Stephen James, director, Pan American Highway Confederation; Barton P. Root, of the Department of Commerce; and Charles M. Upham, engineer-director, American Road Builders' Association.

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H. P. Hackett dies; once PWA housing director

Horatio B. Hackett, 61, noted architect and builder and formerly director of housing for the Public Works Administration, died Sept. 8 at Chicago. A native of Philadelphia, Col. Hackett graduated from West Point in 1900.

His early architectural training was with D. H. Burnham Co. of Chicago, and after the World War he became associated with Holabird & Root, Chicago architects, directing the construction of many important buildings for this firm until 1934, when he joined the Emergency Housing Corp. at Washington, D. C. Later he was named director of housing for the PWA.

Leaving public service in 1938 he was named president of Thompson Starrett Co., New York builders. Early this year he returned to Chicago as president of Materials Service Corp.

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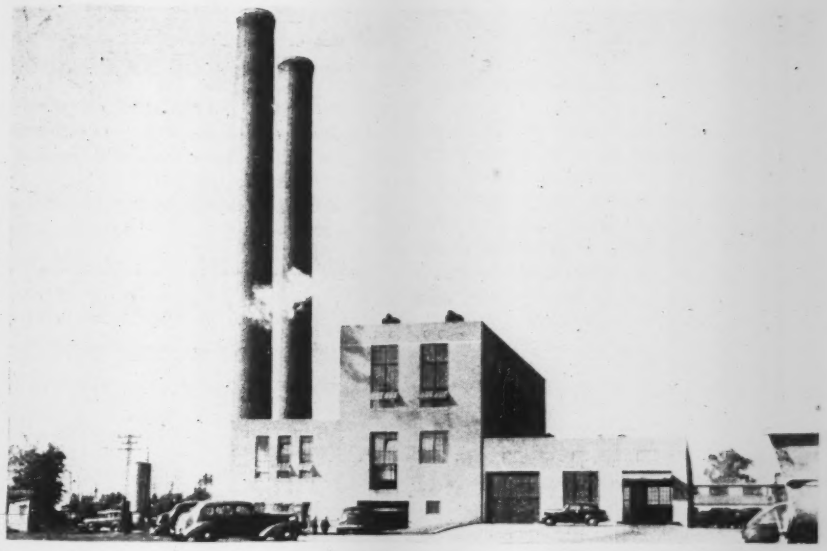
Large power plant under way at Philadelphia

To be known as the Philadelphia Electric Co.'s Southwark generating station, a $45,000,000 generating plant capable of generating 600,000 kw. has been started at Philadelphia. Officials of the company report that the first unit will deliver power by the Fall of 1943. The plant, which will be equipped with four 160,000 kw. generators, is being built on a 62-acre plot at Porter St. and the Delaware River.



This incinerator cannot be used for burning garbage

Detroit's Northwestern refuse incinerator cannot be used for the burning of garbage until an odor nuisance is eliminated, according to a ruling handed down by the Michigan State Supreme Court on Sept. 2. This decision, which upheld the findings of a circuit court in June 1940, is the climax to almost three years of litigation started by residents in the vicinity of the incinerator shortly after the $380,000 structure was placed in operation (ENR June 27, 1940, p. 934).

The court order permits the city to use the plant as a garbage transfer station and to burn combustible rubbish in the furnaces. The 450 tons of garbage handled at the plant will be distributed to three other incinerators operated by the city, according to William M. Walker, Jr., commissioner of public works at Detroit.

Early difficulties with the incinerator operation were laid to the fact that the refuse reaching the Northwestern plant contained insufficient combustible material, whereupon the city added auxiliary fuel in the form of coal. The garbage content was said to range as high as 80 to 90 percent. City officials claim that the plant was operated all summer without any complaints.

BRIEF NEWS

THE STATE of California is seeking insurance for the San Francisco-Oakland Bay Bridge but cannot find any takers for a $40,000,000 policy. The collapse of the Tacoma Narrows Bridge No. 7 last year has made brokers hesitant about assuming the risk for such a structure. The bridge and its electric passenger railway cost $92,000,000.

STATE HEALTH authorities of Pennsylvania have closed the bridge unit in the state's highway department for an undetermined time because T. Robert Graham, bridge engineer, was stricken with an attack of infantile paralysis recently. The disease is prevalent in several sections of Pennsylvania and every precaution is being taken to limit its spread. Fifteen bridge engineers are attached to the closed unit and the order halts work on the design and planning of about $10,000,000 worth of highway projects.

OBITUARY

ALEXANDER S. DAWSON, chief engineer for the department of natural resources of the Canadian Pacific Ry., died recently in Guelph, Ont. He joined the Canadian Pacific in early manhood and in 1901 went to Calgary, Ont., as division engineer. When the department of natural resources was formed in 1903 he was made chief engineer of that department. He retired in 1932 on account of ill health after 37 years of service with the natural resources department.

WILLIAM H. VANDEBURGH, 67, assistant city engineer at Los Angeles, died Sept. 1 in that city.

EDWIN VAN GOENS, 40, structural engineer in the bridge division of the Los Angeles engineer's office, died Aug. 30.

CARY M. VANDERFORD, 63, president of the Arizona Concrete Co., died Sept. 2 in Redondo Beach, Calif.

RAYMOND WALSH, 56, district maintenance superintendent for the Washington highway department, died Aug. 31 in Eugene, Wash.

GEORGE W. KELLER, 56, state WPA administrator for Iowa, died in Grinnell, Ia., Aug. 29 as a result of an automobile accident. Mr. Keller, a graduate of the University of Iowa in the Class of '08, taught at that school from 1913 until 1933, when he was given a leave of absence to become chief engineer of the Iowa CWA. Following year he became chief engineer of the Iowa Emergency Relief Administration. Mr. Keller had been a member of the Iowa State Board of Engineering Examiners since its inception, and its chairman in 1936.

CHARLES MELVIN ADAMS, 81, retired civil engineer of Bellingham, Wash., died in that city Aug. 31. He was employed as civil engineer by several railroads in the Eastern part of the nation before moving to Bellingham in 1890 to work with the old Bellingham Bay and British Columbia R. R. Starting in 1892 he served for several different periods as city engineer of Bellingham.

JAMES B. STOKES, who was this year appointed district engineer for the Arkansas state highway department at Batesville, Ark., died Aug. 25. He was at one time connected with the federal government and also served the WPA.

ANDREW MARTIN, 58, city engineer of Prairie du Chien, Wis., for the past 20 years, died recently.

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION awards for the week total $139,478,000, topping the volume of the corresponding 1940 week by 103 percent. Public construction is 246 percent higher than in the week last year as a result of the high volume of federal work. Private construction, however, is 54 percent lower than a year ago.

The current week's award total brings 1941 construction to $4,559,119,000, an increase of 100 percent over the total for the corresponding 1940 period, and 14 percent higher than the total for the entire year 1940. Public construction, $3,635,306,000, is up 128 percent compared with the 37-week period last year due to the 350 percent gain in federal work. Private awards, $923,813,000, are 34½ percent over the volume for the period a year ago.

In the classified construction groups, gains over the short preceding week are in waterworks, bridges, industrial buildings, public buildings, and earthwork and drainage. Increases over the 1940 week are in waterworks, bridges, public buildings, earthwork and drainage, and unclassified construction.

New capital for construction purposes for the week totals $428,529,000. This brings the 1941 total to $5,842,664,000, a 131 percent increase over the $2,523,270,000 reported for the 37-week period last year.

CONTRACTS
(Thousands of dollars)

	Week Ending Sept. 12 1940	Sept. 4 1941	Sept. 11 1941
Federal	$ 7,834	$54,225	$103,622
State & Municipal	28,102	20,868	20,706
Total public	$35,936	$75,093	$124,328
Total private	32,769	14,921	15,150
TOTALS	$68,705	$90,014	$139,478
Cumulative			
1941 (37 weeks)			$4,559,119
1940 (37 weeks)			$2,279,987

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	1940 37 weeks	Cumulative 1941 37 weeks
NON-FEDERAL	$1,324,598	$1,016,546
Corp. Securities	169,355	302,257
State & Mun.	605,968	335,629
U.S.H.A. loans	170,379	30,399
R.F.C. loans	194,996	84,761
R.E.A. loans	...	100,500
Federal Aid—Hwy.	184,000	163,000
FEDERAL	$1,198,572	$4,826,118
TOTAL CAPITAL	$2,523,270	$5,842,664

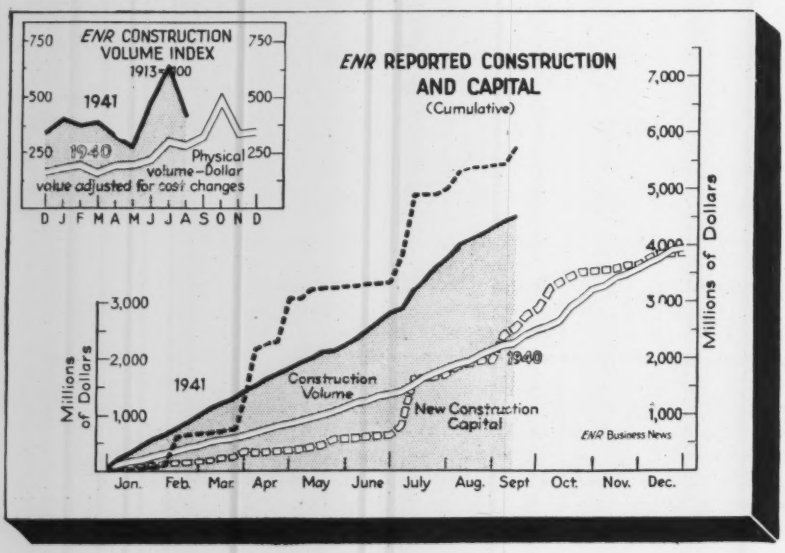
FHA MORTGAGES

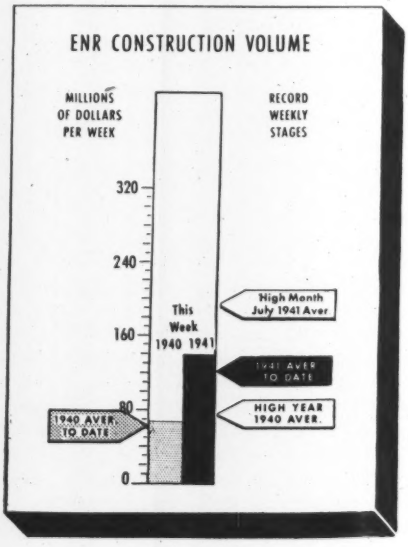
	Week-Ending Sept. 7 1940	Aug. 30 1941	Sept. 6 1941
Selected for appraisal	$22,945	$27,082	$23,185*
Cumulative			
1941 (36 weeks)			$1,040,993*
1940 (36 weeks)			$ 900,125

* Subject to revision.

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost	Sept. '41	263.12	126.48
Building Cost	Sept. '41	214.58	116.00
Volume	July '41	434.00	190.00


ENR CONSTRUCTION VOLUME INDEX
1913=100
1941
1940
Physical volume—Dollar value adjusted for cost changes
D J F M A M J A S O N D
ENR REPORTED CONSTRUCTION AND CAPITAL
(Cumulative)
Millions of Dollars
Construction Volume
New Construction Capital
ENR Business News
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.


ENR CONSTRUCTION VOLUME
MILLIONS OF DOLLARS PER WEEK
RECORD WEEKLY STAGES
This Week 1940 1941
High Month July 1941 Aver.
1941 AVER. TO DATE
HIGH YEAR 1940 AVER.
1940 AVER. TO DATE

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Tacoma Narrows Bridge

Sir: The series of articles and correspondence in *Engineering News-Record* on the failure of the Tacoma Narrows Bridge has been read with much interest, and a word of congratulation may not be out of place for those who have so speedily diagnosed the causes of the disaster and suggested remedial measures.

Although we have no long suspension spans in Australia of the typical modern American design, it is, nevertheless quite possible that an occasion will arise, in the post-war reconstruction period, to consider such a design as an economical proposition. It is, therefore, to be hoped that the Tacoma disaster will not mean a putting back of the clock of progress.

Of particular interest is the discussion of torsional stiffness by one of your correspondents. It should not be difficult to give torsional rigidity to a suspension bridge deck structure by raising the floor to the top of the stiffening girders and adding lateral bracing in the plane of the lower flanges and also vertical trussing under the transverse girders. It only means a loss of a few feet in clearance height. With such a design, moreover, it would be easier to install end braking devices on the longitudinal center line and thus avoid a possible cause of out-of-step movement of the two side girders.

As regards the use of diagonal braces to damp out the typical longitudinal undulation, two experts are, it appears, in sharp conflict as to the relative efficacy of the two possible directions of inclination. An outsider might assume that there was some merit in both and, if this idea is carried to a logical conclusion, we might have all the hangers, or at least the longer ones, inclined alternately in either direction. This principle has been successfully applied to bowstring arches (*ENR*, April 25, 1935, p. 577). If model tests demonstates the efficiency of such an arrangement in checking wind oscillations it would also help to obivate the need for deep stiffening girders for moving loads. The added difficulties of erection should not prove insurmountable.

CHARLES O. HARRISON
Consulting Engineer
Sydney, N. S. W., Australia

Designing Against Bombs

Sir: In O. Bondy's article, "Buildings under Bombing" [*ENR*, Aug. 14, 1941, p. 66] he refers to a lateral sucking force as causing considerable damage in bombings.

First, let us consider what happens when a bomb explodes. The explosion generates, at first, an outward force that pushes everything out of its way including the air about it and thereby creating a vacuum at the center of the explosion. It is this vacuum with its resulting inrush of the surrounding air that causes those lateral sucking forces.

Assuming that a structure is capable of withstanding the initial force of an explosion, its exterior walls will then be subjected to zero pressure on the outside and atmospheric pressure from within, thereby tending to push the walls out with a force of 14.7 lb. per sq.in. or 2,100 lb. per sq.ft.

It is quite evident from photographs of scenes of explosions that such a force does exist. Victims of explosions are often found minus shoes and with clothes burst open. It is highly improbable that the initial blast, would blow off the victim's shoes and leave his feet behind. It seems more likely that because the interior of the shoes and clothes were at atmospheric pressure prior to the blast, the tossing of the body through a vacuum, would place tremendous internal pressure on the victim's clothes and blow them off.

Another point that might be cited: very often tall brick chimneys remain miraculously standing while all about them is shambles. Applying the same reasoning, the arched walls of the chimney withstand the initial lateral force of the blast, while the interior of the chimney [probably having been in recent use] being also a vacuum, balances the suction force of the explosion and weathers the blasts as long as the chimney does not receive a direct hit. This leads to the suggestion that a satisfactory bomb-proof shelter might be designed on the principle of the ordinary vacuum thermos bottle.

JACK G. LEWIS
Brooklyn, N. Y.

Sir: In his article, "Buildings Under Bombing", O. Bondy compares resistance to bombing to earthquake resistance, and stresses the importance of high resistance to fire in structures. I would like to point out that flat slab construction came through the Helena, Mont., earthquake without important structural damage although the buildings there at the time were not designed to be earthquake-resisting. Mr. Bondy says that beams and girders have proved to be vulnerable points in structures. Naturally the collapse of a beam or girder will collapse the floor which it supports. In a flat slab structure a considerable hole can be punched through the slab without collapsing it. The superior fire-resisting properties of flat slab construction are well-known and recognized.

Saving structural steel and reinforcing steel for national defense has become a necessity. It would be well for those charged with the design of structures to remember that less reinforcing steel is required to carry a given load by means of flat slab construction than for any other type of reinforced concrete, column-supported, assuming ordinary conditions. Where necessary or desirable, flat slab can be used in combination with steel columns, quite as readily as with reinforced-concrete columns, and at the same time the objectionable concrete caps can be eliminated by the use of steel grillages in the floor slabs and roof slabs at the columns. Thus much of the flexibility of a steel structure is gained with a minimum amount of structural steel.

The new Standard building code of the American Concrete Institute provides a simple means for designing flat slabs to fit practically any column spacing or number of bays, one bay if necessary. Thus the structural engineer can revise his thinking and apply flat slab construction to a multitude of cases for which it has heretofore been considered unsuitable and save steel for defense and money for his clients.

WALTER H. WHEELER
Consulting Engineer
Minneapolis, Minn.

EDITORIALS

VOLUME 127 NUMBER 11

September 11, 1941

Dam Destruction

BLASTING OF THE GREAT DAM across the Dneiper River at the foot of the rapids near Kichkas, as Russian engineers are reported to have done, is something to stir the imagination of engineers whose energies, generally, are devoted to making dams stable against attacks by nature's forces. How, indeed, to destroy a massive concrete dam poses a considerable problem. The Dneiper Dam is about 130 ft. thick at the base and 140 ft. high to the spillway crest, above which are massive piers carrying crest gates, the operating bridge and a highway bridge (*ENR*, Sept. 4, 1941, p. 321). Drilling and blasting a section of the base that rests on a rock reef near midstream would have been possible, but elsewhere the dam is carried to rock through a bed of coarse gravel, which would have precluded undermining without long preparation. It seems more probable that the dynamite charges were placed inside the dam in the operating gallery, a view that is supported by the only published picture of the dam which indicates that a long section of the crest near midstream has been blown off. As the reservoir is large, the discharge through this opening would have effectively blocked bridge reconstruction, while the power machinery could have readily been wrecked by more simple methods. But by whatever means the Dneiper River dam was destroyed, the story of its destruction will make a fascinating chapter in the history of the war on the eastern front.

Concrete Ships—Act II

DECISION of the U. S. Maritime Commission to build a large number of concrete oil barges should convince the most skeptical that it believes there is a steel shortage. For on the basis of experience with concrete ships in the last war, this would seem to be trying to conserve steel the hard way. Still, success with the concrete ship may not be so elusive this time. For one thing the concrete art, both design and construction, is far ahead of what it was in 1918. Higher-strength concrete can be made without difficulty. The internal vibrator is available to aid placing dry mixes in forms congested with reinforcing bars. The problem of distributing shear in the hull, which troubled the designers of two decades ago, will be better understood. Skilled concrete workers are presently plentiful, whereas they were scarce in 1918. Finally there is one other favorable factor that was absent during the earlier effort: No one has yet claimed that the concrete ship is going to replace the steel ship on all the oceans of the world. Modesty apparently is to be tempered with pioneering this time. In other words, proponents of the concrete ship are first going to save some steel. Then they are going to build the strongest, tightest, lightest, most seaworthy and economical ship that it is possible to build out of concrete. Backed by the considerable experience accumulated in building the first concrete ships, by the great advances in concrete design and equipment, and by the challenge that every pioneering effort holds for construction men, such a program would seem to offer a good chance of success. *Bon voyage!*

Meeting the Challenge

TASTE AND ODOR CONTROL in water supply have become second only to purity in the standards of quality desired by the American public. Ever responsive to a challenge for better service, the waterworks profession has made amazing progress in providing the means for eliminating even the most persistent tastes and odors. Treatment processes involving singly or in combination the use of aeration, activated carbon, chlorine, ammonia and ozone have been developed largely within the last decade. Most recent technique, which has yielded spectacular results in the production of potable water, has been the application of breakpoint chlorination. And one of the most interesting developments in removing obnoxious tastes and odors from an industrial-polluted supply is the combination process at Whiting, Ind., which employs ozone in combination with chlorine and ammonia (see p. 93). Ingenuity and painstaking research are meeting the challenge of eliminating taste and odor from water.

SPAB and Construction Materials

WHETHER the juggling of jobs and men in OPM (defense production) and OPAC (civilian supply), which brought forth the super-agency to be known as the Supply, Priorities and Allocations Board, or SPAB, was any more than an expedient to quiet internal organization troubles, only time will tell. In theory it provides the machinery for integrating defense production with production for essential

civilian supply and as such its potential effect on all activity, including construction, is tremendous. That part of construction that is working on defense, and it is a very large part of the industry, will probably note little change; by and large, materials and equipment for this work have always been available. Those jobs farther down on the urgent list should, however, get a lift. For one thing, SPAB says it is going to discourage "scare buying against imaginary requirements" and that it is going to rout out materials "hoarded in cellars and attics". If such statements are implemented by action, even to including Army and Navy, some currently scarce materials might prove to be available in considerable quantity. At the least such a forthright policy will reveal which material shortages are real and which are a result of inflated priority buying. With such facts available, engineers and construction men can go to work with a will to devise and utilize substitutes. So far the absence of such believable facts has fostered procrastination and deadened ingenuity.

Public Works Planning

DURING THE PAST FEW WEEKS preliminaries have been cleared out of the way to permit the Public Work Reserve plan to begin functioning. Its sponsors, the Federal Works Agency and the National Resources Planning Board, have appointed regional directors and have conducted meetings in various cities to familiarize federal officials with their necessary jobs of cooperation with local governments. Manning of the regional offices is now under way, and before long representatives will begin calling on state, city and county officials.

It is important that the PWR and its function be understood, for its purpose is laudable, and its present objective, if we understand it correctly, is compelling. As to purpose, PWR was set up to sell the advantages of long-range public works planning to local governments; the model is a six-year program as developed by the Resources Board for the federal government, a program that is to be revised annually as projects are taken from the list for actual construction. The objective is to get a broad program of public works outlined now so that construction from it can be used to cushion the shock that reduction of defense spending will cause. As an advocate of business-like municipal housekeeping and of insurance against a rainy day, the Public Work Reserve is a constructive development. Local government officials have much to gain, both for their communities and for the nation at large, by giving prompt cooperation to the PWR effort.

The immediate task of PWR is to accumulate a listing of needed public improvements. In this respect the task is somewhat reminiscent of the early days of PWA, although the objective is an orderly, well thought out program rather than a mere inventory; it is furthermore necessary that local projects be selected realistically as regards local financing, for no promise of federal aid is involved. With the programs outlined, PWR then envisions surveys, investigations and design of the most urgent and useful projects so that they will be ready for a quick start on a construction program when and if needed. Federal manpower and money will be brought into this designing stage, according to the plan. In short, long-range planning of public works is needed now as never before, and the federal government is rightly taking the lead in fostering it.

In urging cooperation with PWR in its efforts to place public-works planning on an efficient basis, however, sight should not be lost of certain dangers. One of these may be to regard PWR representatives as emissaries of Santa Claus, offering billions of dollars from the federal treasury for local spending; such an attitude on the part of either PWR or local officials will get us right back into a make-work program and federal paternalism; and less rather than more WPA is what public-works planning needs. There is also the danger that PWR may tend to centralization and bureaucracy when the project design stage is reached, whereas local engineers and consultants, operating in their normal relationships, offer the only efficient way to handle this part of national planning. In brief, the Public Work Reserve represents an attempt to apply engineering thought to what is essentially an engineering problem. It deserves the utmost in local cooperation but on a basis of local self-help rather than local self-seeking. And on its own part PWR has a responsibility to make its planning program a prelude to a healthy, decentralized and financially-sound design and construction program. On any other basis we will have federal and not national planning of public works.

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Fig. 1. The stepped seawall that forms the major structure in the waterfront development at Corpus Christi begins where high land approaches the shore at the lower left and extends along the whole front of the city. Between the seawall and the old waterfront is filled land. In front of the wall are the new boat basins, pleasure piers and the breakwater.

Seawall and Waterfront Development Completed at Corpus Christi

***Contents in Brief**—To protect low-lying areas along its waterfront from storm damage, Corpus Christi, Tex., has built a long seawall, has filled in behind the wall and has built a wide boulevard on the filled land. Offshore, behind a rock breakwater built some years ago, pleasure piers and yacht basins have been constructed.*

CORPUS CHRISTI, Tex., is now completing a two-mile-long bayfront development that protects low-lying parts of the city from damage in time of Gulf storms and at the same time converts the waterfront from ugly flats to an attractive and useful municipal park and recreational area.

Corpus Christi is situated on the west side of one of the numerous wide bays lying behind the low sand islands that fringe much of the west side of the Gulf of Mexico. The old part of the city lies along the beach area between the bluff and the bay, land that is only a few feet above sea level. In 1919, a tropical hurricane, sweeping in across the 15 miles of open water in front of the city, carried water and debris into the city on an 11½-ft. tide, wrecking all buildings in its path and causing much loss of life. As a result of that disaster, the state legislature passed an act in 1921 remitting part of the state *ad valorem* taxes in seven counties in the Gulf Coast area for 25 years to provide funds for protective work. In 1924 Corpus Christi financed construction of a stone breakwater with a bond issue backed by the remitted taxes, and in 1938, due to higher tax receipts resulting from expansion of the oil industry, increased population and opening of a deep-water port, plans were begun for the work now nearing completion. Although all the money was not then in sight, a contract was let that covered the entire project, provided the needed bond issue was approved. Since then the period during which taxes will be remitted has been extended 10 years and new funds have been provided.

Work was begun Jan. 1, 1939. It includes about 12,000 ft. of reinforced-concrete seawall, 2,000,000 cu.yd. of dredged fill behind the wall, grading and paving the dual-lane Shoreline Boulevard and connecting cross-streets on the new fill, construction of T-head recreation piers and yacht basins in the sheltered waters behind the breakwater, construction of a backwater levee near the Turning Basin and reconstruction of stormwater drains along the waterfront. The whole undertaking will cost $2,400,000.

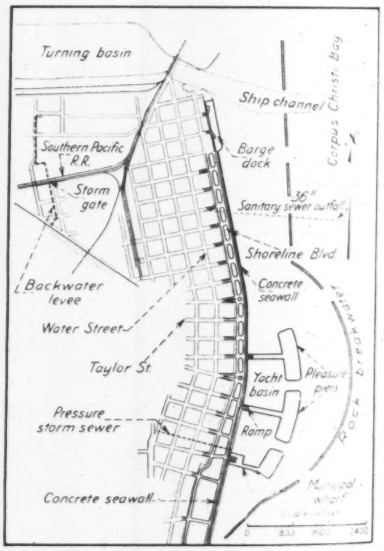


Fig. 2. Corpus Christi waterfront. New work carried out as part of the present development includes the Shoreline Boulevard, the seawall, yacht basins and pleasure piers.

Riparian rights of landholders along the old waterfront were acquired by the city in exchange for the filling in of land and additional property that heretofore was largely under water. This gave the city full control of the area between the private property and the new wall, permitting its use for park purposes.

Hydraulic filling along the site of the seawall was begun by the contractor in advance of construction to facilitate the construction operations. The steel sheetpile cutoff then was driven and the concrete for the toe of the seawall was cast in a trench dug along the cutoff, the trench being kept dry by pumping.

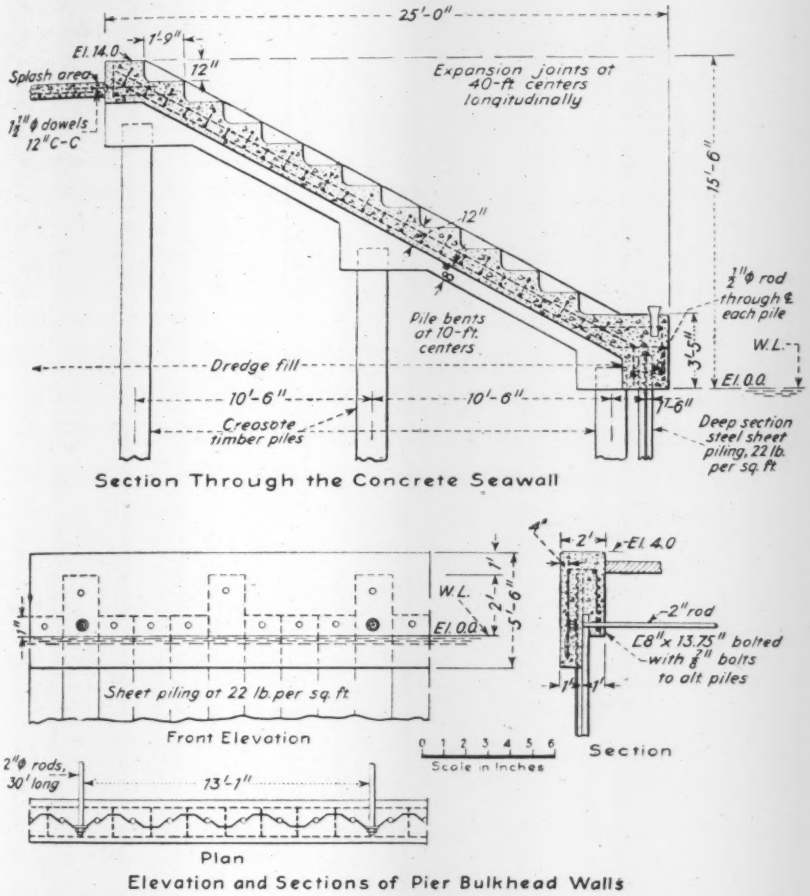


Fig. 3. Principal details of the stepped seawall and of the sheetpile wall used for the pleasure piers.

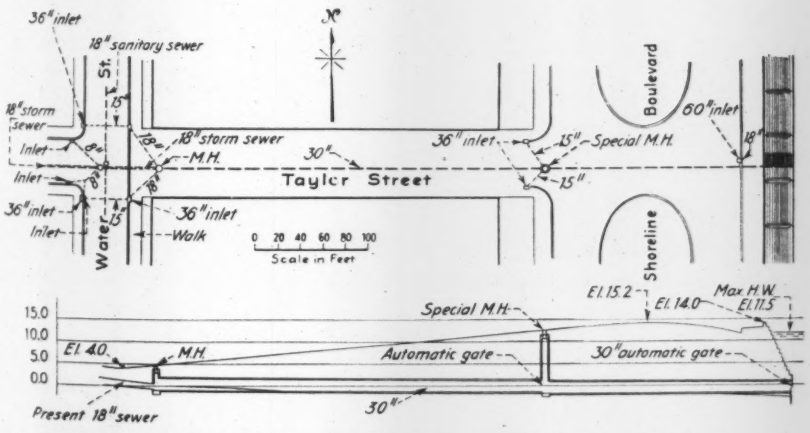


Fig. 4. Plan and section through the new work at the foot of Taylor St., showing a typical arrangement of the storm drains.

This piling goes from 14 to 40 ft. below water level and the creosoted timber piles that carry the wall range from 15 to 59 ft. in length. These piles showed an indicated bearing capacity of 36 tons, but were designed for only 13 tons. Special attention in the design work was given to the loads to be imposed on the wall during storms. The loads used were a live load of 498 lb. per sq.ft. of slab and a dead load of 187 lb.; a total of 700 lb. being assumed for the design. Design computations are given in *Civil Engineering*, September, 1939, p. 536.

Principal details of the wall are given in Fig. 3. It was built on the graded fill, heavy kraft paper being used to cover the sand after the surface had been graded carefully to the desired slope. Recesses for the beams and pile caps were cut in the compacted fill.

Travelers were used in building the wall, one to hold the reinforcing steel for the beams while it was being assembled and one for the concreting operations. After assembly, the steel for the beams was lowered into place in advance of the concreting traveler. The latter, 40 ft. long (the length of one section of the wall between expansion joints) was roofed over to protect the concreting operations in case of a sudden shower and to shade the fresh concrete. This traveler supported the forms for the steps and carried the vibrators.

The construction program was laid out for completion of one 40-ft. section each day.

Storm sewers

A major problem in design of the new waterfront facilities was provision for stormwater. Along Water St., the low point behind the new fill, the storm sewer in each east-west street is carried through the wall, as shown in Fig. 4, and each is equipped with two automatic gates, one at the outlet and one at the manhole near the west side of Shoreline Boulevard. This latter gate serves to keep water coming over the wall from going back into the low area along Water St. Shoreline Boulevard and the walk back of the seawall act as a splash area, the boulevard being crowned to return spray toward the bay.

Rain water accumulating in the low area will flow north to the backwater levee, where considerable sur-

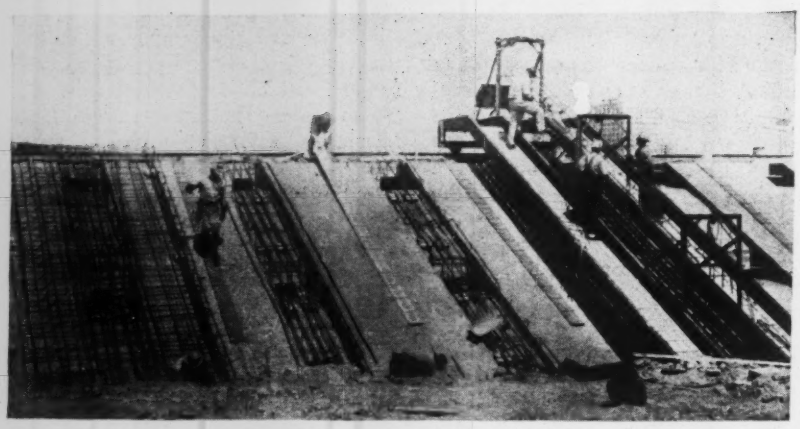


Fig. 5. Reinforcing for the beams, which carry the stepped wall, was assembled on the traveler shown at the right and then was lowered into place. Reinforcing for the steps then was wired into place.

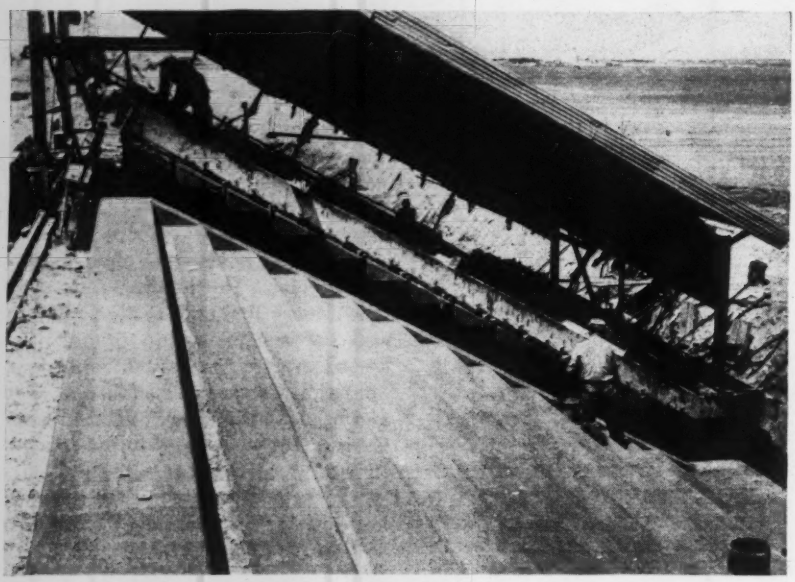


Fig. 6. Concreting of the seawall was carried on with a traveler that was roofed to minimize delays due to weather.

face storage is available. This area in turn finds relief through culverts under the backwater levee, which are equipped with flap valves that permit outflow whenever water on the land side is higher than in the bay.

Drainage from higher parts of town coming to the waterfront through the arroyo near the south end of the project is carried in a pressure conduit under the waterfront area that extends back into the city to a point at El. 20.

Sanitary drainage goes to a sewage treatment plant near the backwater levee whence it is pumped to the bay after treatment.

Three T-head pleasure piers have been built out into the sheltered area between the breakwater and the seawall. They also form protected basins for yachts and other small boats. These piers are formed by simple steel and concrete bulkheads, as shown in Fig. 3. In the shore arms of these piers, which are about 65 ft. wide, tierods run through the fill from side to side, but in the pier heads, which are about 300 ft. wide and 1,000 ft. long, tierods are anchored back to creosoted bearing piles.

In hydraulic filling of the area behind the seawall, deep dredging in the areas to be occupied by the pleasure piers was avoided, thus making it unnecessary to use sheetpiling over 20 ft. long for the pier bulkheads. A controlling depth of 10 ft. was maintained for pleasure craft in the area behind the rock breakwater.

A 12.5-ft. concrete sidewalk was laid around the T-heads, and inside the wall a 30-ft. drive, paved with hot asphaltic concrete is provided. Inside the drive, the area is paved with shell to facilitate parking. The shore arms of the piers are paved with two 12.5-ft. concrete walks and a 40-ft. asphalt driveway.

Along the inside of the piers, boat slips with catwalks have been provided. These vary in size for different types of boats and are constructed of creosoted material.

Backwater levee

A backwater levee was built from high ground north of the town across to the filled area along the Turning Basin to prevent water from coming into the city from Nueces Bay, which lies to the north of the city. As the Southern Pacific tracks come into the city by that route, it was necessary to build a storm gate in the levee for these tracks.

At the south end of the project a sheetpile wall capped with concrete has been driven from the shore out to the end of the breakwater to keep sand drift out of the boat basins. At the north end a barge dock about 100 ft. wide and 1,150 ft. long has been built. Its outer wall is at El. 4 and the back wall is at El. 14, the same as the top of the seawall. This is at the southern terminus of the Intra-Coastal Canal.

Shoreline Boulevard

Back of the seawall is a splash area 20 ft. wide paved with concrete. Beyond it are two 40-ft. roadways separated by a grassed median zone having a minimum width of 80 ft., all forming Shoreline Boulevard. Paving is a 6-in. reinforced-concrete slab topped with 1½ in. of asphaltic concrete.

Construction of the shorefront development was under the direction of J. C. Bisset, until recently, city engineer of Corpus Christi; E. N. Noyes, of Myers & Noyes, was consulting engineer on the work, with C. S. Reagan as resident engineer. J. De Puy & Sons, San Antonio, was the general contractor, and Brown & Root, Inc., Corpus Christi, sub-contractor on the paving. Construction on this contract was complete about July 15.

Structural Problems in Bomb Protection

Harold E. Wessman
Chairman, Department of Civil Engineering
New York University

Wm. A. Rose
Assistant Professor of Structural Engineering
New York University

***Contents in Brief**—As a follow-up of their article* Factors in Aerial Bombardment Protection *in* ENR *Aug. 28, 1941, p. 60, the authors discuss the most suitable exterior wall construction for buildings to provide protection against bombs. Consideration is given to the most favorable design of interior walls, partitions, floor systems and stairways. Problems of designing bomb-resistant shelters are reviewed, with the study including sanitary, ventilation, and space requirements. Finally the recommended practices for shelters are summarized in the design of a shelter for 1,200 persons.*

THE DEGREE OF PROTECTION that can economically be given to new buildings, although not the most spectacular, is probably the most important problem in a long-range planning program for civilian protection against aerial bombardment. That present-day construction, based on codes developed from a consideration of peace-time safety requirements, is not adequate to resist even the secondary effects of bombing, let alone the tremendous direct effects of impact and explosion, is evident. With buildings not vital to national defense the increase in cost to provide greater bombing resistance must of necessity be kept small. This means that a careful study of present code requirements is necessary, and that only those changes of reasonable cost that assure a marked increase in a building's safety should be proposed.

As far as structural damage is concerned, it may be cheaper to insure an ordinary building against bombing rather than to use a more resistant type of construction. On the other hand neither insurance nor any other money may be able to buy the necessary materials for repair purposes during a total war, nor will insurance provide for the resultant loss of operating revenue or replace the lives that might have been saved if a more resistant type of construction had been used initially.

In view of the economic limitation, three guiding principles of a general nature may be established. First, building construction should be designed to minimize and localize the effects of direct hits. Secondly, all buildings, with the possible exception of houses and small apartments, should be designed to resist the indirect effects of bombing, that is, blast, fragmentation, anti-aircraft shell fragments, falling debris, and fire. Finally, where the requirements for direct hits conflict with those for the secondary effects, the latter should govern. It should be realized that these general statements are subject to many exceptions, and, in the final analysis, a careful study of any proposed building is essential to determine the exact nature of the departures from normal construction. At the same time, there are certain elements common to all buildings that should be restudied in the light of the bombing hazard, in order to evaluate their suitability or to suggest possible modifications. In many cases, to modify building codes and thus make mandatory all new construction requirements, which are of a sufficiently general nature to come within the building code's scope, may seem desirable.

Wall-bearing construction

One of the most important construction elements in any building is the exterior wall system. It is not surprising that a study of the damage done to buildings in England and elsewhere reveals that wall-bearing construction offers little resistance to the effects of direct hits while skeleton construction in general suffers only local damage. Many engineers and architects have long felt that limitations on wall-bearing construction were not sufficiently rigid. There will be no better time than the present to recommend that this type of construction be confined to residential structures less than four stories in height, and that all other structures should have a skeleton framework of reinforced concrete or steel. In making this recommendation, the authors are well aware that a substantial increase in cost of many buildings will be an inescapable result. That this increased cost is prohibitive, however, is certainly not true. This is evidenced by the fact that several six-story apartment buildings of the skeleton type have been constructed in New York City within recent years and are now being operated on a paying basis.

Under present building-code requirements, panel walls in skeleton construction are designed to have certain degrees of fire resistance, and to be stable under those lateral forces to which the walls might normally be subjected. The thicknesses of different wall materials for resistance to fire and resistance to blast and fragmentation are not related. For example, mild steel plate is highly resistant to all the effects of bombing, but is not a good material for fireproofing in that it permits a high temperature rise on the side away from the fire. On the other hand, cinder concrete has excellent fireproofing qualities but offers a relatively small degree of protection against fragmentation. Fire-resistive ratings for walls and partitions, as set forth in the New York City building code, which requires exterior walls of fireproof buildings to have a four-hour fire rating, are given in Table II. That the materials listed in Table II vary widely as to resistance to bombing effects is obvious. Table III shows the approximate thicknesses of walls built of similar units necessary to resist blast and fragmentation. It would appear that certain types of units now

commonly used would not be suitable under the new conditions. To develop new combinations of materials to satisfy both the old and new requirements would be advantageous.

The foregoing or similar recommendations should be followed for all walls that may be subjected to blast and fragmentation. In general, this would apply to about the first three floors of a building with bombs landing in the street. The possibility of the explosion of the bomb on a setback roof, or the roof of an adjacent lower building, should not be overlooked. In this case, however, the bomb will not explode at that level unless provided with an instantaneous fuse, and this type of bomb has been but little used in the present European conflict. With the exception of these cases, present code requirements would probably be satisfactory for the upper floors, but even here the use of hollow building units without a solid facing should be avoided.

Problem of windows

There is no particular point in trying to make building walls resistant to blast and fragmentation if nothing is done about the large window openings found in the majority of structures. To eliminate windows completely on the lower three floors of all buildings, and to cut down the number and size of openings in the upper floors seems desirable. In some types of buildings, the re-arrangement of facilities on the lower floors would permit the elimination of glazed openings. Where windows are to be eliminated from rooms designed for human occupancy, mechanical ventilation and artificial lighting must be relied upon. Although this results in an increased cost, some saving is effected in the heating system. Likewise, controlled lighting and ventilation are far superior to natural light and air, but it will be a matter of education over a period of years to accustom people to windowless structures.

In recommending changes for interior walls and partitions, the authors believe that the purpose of the wall or partition in question should serve as the criterion. For example, party walls and fire walls are intended to separate structures or parts of structures into separate units; corridor partitions and stairway enclosures are intended to protect people from fire hazards; and elevator enclosures are intended to separate the shaftways from each other and from the remainder of the building. Obviously, all of these walls and any other walls or partitions enclosing important equipment or possible shelter zones should be made resistant to the secondary effects of bombing.

TABLE I—RECOMMENDED MATERIALS THICKNESSES TO PROTECT AGAINST BOMB FRAGMENTS*

Mild steel plates or plates of an aggregate thickness	1½ in.
Solid brickwork or masonry	13½ "
Reinforced concrete	12 "
Plain concrete	15 "
Earth or sand	30 "
Ballast or broken stone	24 "
Wood, minimum	40 "

*Data if for a 500-lb. bomb exploding 50 ft. away

Floor systems

The main considerations in floor systems are: (1) localizing damage; (2) keeping the number of floors which might be penetrated by a bomb to a minimum; and (3) reducing to a minimum the possible debris resulting from a direct hit. Where usable, flat-slab floor construction offers a good solution. Next in order come the two-way slab and the one-way slab. Ribbed slabs and other lightweight floors offer small resistance, and at the same time, the amount of debris may be considerable. As far as framing is concerned, either reinforced concrete or steel gives satisfactory results. Structural frameworks should be continuous in order to prevent a cumulative type of failure, and to confine the damage to a localized area. Roof slabs should have sufficient resistance to prevent the penetration of incendiary bombs; five inches of reinforced-stone concrete or the equivalent will prevent the passage of 1-kg. incendiary bombs, the size most commonly used at the present time.

Where possible, stairways should be placed in the building's interior and with fireproof passages to the street. Exterior stairways and fire escapes should be used only where no alternative is available. Special attention should be given to bulkheads over stairways, and here a high degree of protection should be used, with all glazing eliminated. This is also true of penthouses for elevator machine rooms and similar roof structures. Where necessary, for fire control, shielded ventilation may be provided.

Cornices, balconies, moldings, and other projections from building surfaces are not structural necessities and increase greatly the possible amount of debris that falls in the street as a result of a direct hit. One of the outstanding trends in modern architectural design is the elimination of such projections, so that in this instance there is no conflict between architectural and structural requirements. Display windows on street fronts constitute a further hazard. Where such units are used, the backs should be fully protected against the secondary effects of bombing. In many cases street displays may be replaced by display windows in arcades and lobbies, subject to code limitations. Interior courts are dangerous and should be eliminated wherever possible. This may be accomplished in some cases by a re-arrangement of rooms, and in others by means of artificially ventilated rooms.

The problems presented by the mechanical and electrical equipment of buildings are many and varied. To cut down possible losses in operating efficiency after raids, a general policy of decentralization and duplication of important units should be adopted. The position of all service controls should be well known to the air-raid warden service, as well as the fire and police departments, so that the searching through debris for possible casualties after air raids may be accomplished with a minimum risk.

The problems that arise in connection with the design of specific building types and the problems of strengthening existing structures are so complex and varied that they cannot be treated here. But the broad principles outlined in the preceding

TABLE II—FIRE-RESISTIVE RATINGS OF WALLS AND PARTITIONS

(For complete requirements, see C26-631.0 to 637, New York City Building Code, 1938)

	Gross thickness in inches			
	1 hr.	2 hr.	3 hr.	4 hr.
Solid brick	4	8	8	8
Hollow tile	3*	4*	6*	12
Plain concrete	..	4	8	8
Reinforced concrete	2½	4	5	6
Hollow concrete block	3*	4*	8	12

*Thickness does not include required plaster

paragraphs give some indication of the goal desired, and of the proper method of attack.

Air-raid shelters

Shortly after the present war started, it became evident that all previous shelter studies had been based on the erroneous assumption that an air raid might be of one or two hours' duration. It quickly developed that all-night raids at frequent intervals would be commonplace, and that shelters designed for shorter periods of occupancy were woefully inadequate. As time went on, more and more people in England elected to take their chances at home, rather than seek the comparative safety of a shelter so small and crowded that rest was out of the question. The latest information from London is that only 200,000 of the city's population of 7,000,000 go to shelters during air raids.

In the light of this experience, then, it would seem necessary to start with the assumptions that: (1) shelters must be designed for overnight occupancy; (2) reasonable space should be provided for sleeping accommodation; (3) canteens or small kitchens should be included; and (4) some recreational space should be provided. This may seem like an expensive program, but unless satisfactory shelters are provided the average person will not avail himself of their protection, a situation which would be contrary to public safety. Obviously the larger the shelter, the greater the space that may economically be devoted to supplemental activities. On the other hand, shelters should not be so large that the danger of an epidemic becomes critical.

Shelter classifications

Shelters may be classified by function in four groups: domestic, public, commercial, and institutional. The requirements for these groups vary widely, and space limitations do not permit the inclusion of a detailed description. There are certain general considerations, however, which apply in some degree to all types of shelters. These will now be considered.

An analysis of the cost of bombproof shelters reveals that such shelters are only feasible in very large sizes, say, those built to accommodate 500 to 1,200 people. The great majority of shelters, then, must be designed from the standpoint of resistance to the secondary effects of bombing. The requirements for lateral protection are listed in Table I. In general the requirements for overhead protection are not as great, except where overhead blast can occur. These requirements are listed in Table IV. For cases where a bomb may explode above a shelter roof, the degree of protection suggested in Table I should be followed. In certain cases, the thicknesses required for protection against falling debris may be larger than those given in Table IV. The British suggestions for debris loads are given in Table V.

Where unusually heavy parts of buildings are apt to fall as units, to increase the tabular values by 50 percent is advisable. And where machinery or other heavy objects are likely to be involved in débris loads, the probable effects should be estimated and used for design calculations. The thicknesses given for overhead protection give adequate protection from 1-kg. incendiary bombs, and are more than ample for resistance to anti-aircraft shell fragments. Although gas has not been used to date in the European conflict, provision should certainly be made for the future gas-proofing of shelters without structural changes being necessary.

Floor space per person

Three major items require consideration in determining the necessary size of shelter space proper. First is the floor area. British requirements vary from 3¾ to 6 sq.ft. per person, depending upon the number of persons to be accommodated. The authors wish to point out that if sleeping accommodations are to be provided, there should be at least 30 sq.ft. per person, and in addition, an allowance made for aisle space. This figure may be materially reduced by the use of double-tier bunks. Second is the volume of the shelter space. Here the British recommendation is that 50 cu.ft. per person should be provided. This again would have to be greatly increased if sleeping accommodations are provided. Volumetric requirements would be satisfied by a room whose height bore a normal relation to the other dimensions. Third is the total area of floor, walls, and ceilings. When a large number of people are closely confined, conditions quickly become unbearable, unless there is sufficient surface area in the room to transmit heat to the outside. In other words, cooling of a shelter and not the heating becomes most important.

In addition to the unit requirements, it is suggested that the total number of people to be placed within one shelter compartment should be limited to some reasonable figure. The British recommend that not more than 50 persons be placed within any compartment, and that where the shelter is to be designed for a larger number, the shelter be broken up into the proper number of 50-person compartments, separated by walls resistant to the secondary effects of bombing. Before definite conclusions as to shelter requirements can be formulated, studies for this cli-

TABLE III—ESTIMATED THICKNESSES NEEDED TO RESIST BLAST AND FRAGMENTATION

Material	Gross thickness in inches
Solid brick	12½–16½
Hollow tile	30
Plain concrete	Table I
Reinforced concrete	Table I
Hollow concrete block	36

TABLE IV—THICKNESS REQUIRED FOR OVERHEAD PROTECTION*

Mild steel plate	¾"
Reinforced concrete	4"
Plain concrete	6"
Brick (arched)	8½"
Ballast, broken stone or earth	1' 6"

*Recommended by British

TABLE V—DEBRIS LOADS*

Stories above shelter	Static load lb. per sq. ft.
Wall Bearing Construction	
1–2	200
3–4	300
5 and over	400
Skeleton Construction	
Unlimited	200

*Recommended by British

Harris & Ewing Photo

Many London brick surface shelters are being replaced by reinforced-concrete structures designed by Sir Giles Gilbert Scott, architect of Liverpool Cathedral. This view shows construction of blast wall at a shelter's entrance.

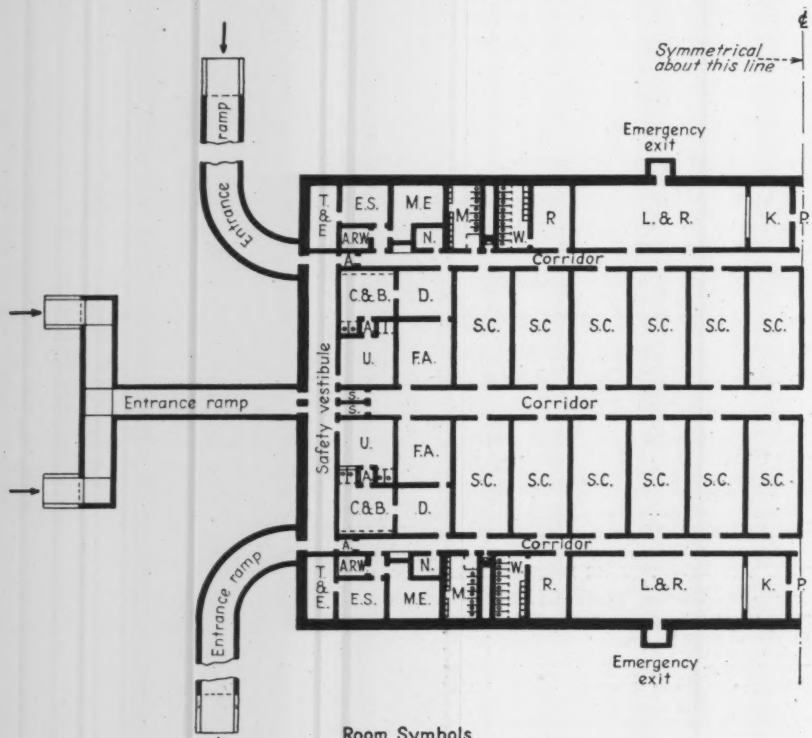
mate should be undertaken. Because of the nation's wide variety of climatic conditions, shelter standards might vary considerably.

A great deal of attention should be devoted to the design of sanitary facilities for shelters. The number of fixtures may be determined in accordance with the requirements of the city or state building codes. In the larger shelters, two or more sets of toilets should be provided for reasons of convenience and safety, with all toilet room fixtures preferably connected to regular house drains and sewers. The use of sewage ejectors is objectionable because of the danger of damage to mechanical equipment during air raids. Reserve chemical water closets should be provided in the event that sewers might become damaged or destroyed. In all of the larger shelter types decontamination centers should be provided for people who may have been exposed to poisonous gases. Such centers should consist of an undressing room with storage space for contaminated clothing, a cleansing room with hot and cold showers, and a dressing room with a supply of fresh clothing. Although the British state that a space of 300 sq.ft. should be set aside for this purpose, the authors believe that the size should be considerably larger in order to minimize congestion problems, and should be related to the number of people involved. It is further recommended that duplicate decontamination centers should be provided where the shelter is designed to accommodate more than 500 persons. All shelters should be provided with first-aid stations adjacent to decontamination centers where these are used.

All large shelters and many small shelters should be provided with mechanical ventilation. Since power failures may occur, an auxiliary method of operation should be provided. Each ventilating unit should be provided with duplicate intakes, and a separate ventilating system installed for toilet rooms. Previously mentioned was the fact that cooling may be more important than heating in crowded shelters. Nevertheless, a small heating plant is desirable for winter use.

Plan below illustrates application of the foregoing principles to a specific problem—a 1,200-person shelter of the subsurface type, which in peacetime might be used as a public garage. That good garage design and good shelter design are not consistent should be noted. A non-subsidized garage built on expensive land should be at least 12 stories high to be profitable, and should be nearly automatic in its operation to avoid delays in car delivery. Such a garage could not easily be converted to shelter use, and would be too large in any event, if shelters are limited to protecting 1,200 persons.

The authors have emphasized only the structural problems associated with civilian protection. Need we point out that engineers must also consider the difficulties arising from damage to water supply and sewage disposal systems, gas distribution mains, and power and communication lines? The maintenance of vital transportation links is a major problem, too, and one calling for the closest cooperation between civilian and military authorities, in order that there may be no conflict between military and essential civilian use. All these other phases cannot be discussed in detail in this article, but to know that the Secretary of War recognized the fundamental nature of these engineering problems by appointing the National Technological Civil Protection Committee with the country's major engineering and architectural societies represented is reassuring. Walter D. Binger, Commissioner of Borough Works, Borough of Manhattan, New York, is that committee's chairman. Mr. Binger is also the chairman of the National Committee of the American Society of Civil Engineers on Civilian Protection in War Time. This society, early recognizing its responsibility in a civil defense program, has appointed numerous local section committees to work closely with the national committee in the dissemination of pertinent technical information to defense authorities. Only through the fullest cooperation and utmost effort of the larger part of the country's professional engineers and architects will satisfactory solutions be developed for the tremendously complex problems that may shortly confront this country.



Room Symbols

A	Air lock	M.E	Mechanical equipment
A.R.W.	Air raid warden	N	Nurse's room
C&B.	Cleansing and bleeching room	P	Pantry
D	Dressing room	R	Women's rest room (150 women)
E.S.	Emergency squad	S	Stretcher air lock
F.A.	First aid room	S.C.	Shelter compartment for 50 people
K	Kitchen	T.& E.	Tools and equipment
L&R.	Luncheon and recreation room	U	Undressing room
M	Men's toilet (150 men)	W	Women's toilet (150 women)

Functional design of an underground public shelter for 1,200 persons.

Moving a 2,500-ton Hangar Building

P. M. Barnes
Superintendent, Eichleay Corp.
Pittsburgh, Pa.

IN PLANNING an expansion of plant facilities at the Pratt & Whitney Aircraft Corp., East Hartford, Conn., engineers were confronted with the problem of removing two large airplane hangars belonging to the United Airport, from a field adjacent to the east wall of the aircraft works. Investigations indicated it was more economical to move the hangars intact to a new location than to dismantle and re-erect them.

Both hangars are of steel frame construction with brick curtain walls and both consist of two or more connected structures. The larger building is made up of a 163x127-ft. main hangar, a 163x43-ft. machine shop attached to the west wall of hangar and a 163x65-ft. overhaul shop attached to the west wall of the machine shop. The smaller building contained an 81x127-ft. hangar and a two-story 21x81-ft. office building. Each building was moved as a single unit, the respective weights being 2,500 and 1,000 tons. The large building was moved 1,000 ft. east and 1,400 ft. north and the smaller building 1,000 ft. east and 2,800 ft. north.

Both structures were prepared for moving in the following manner: Steel brackets were welded to all of the columns and a steel carrying frame was assembled underneath the brackets. The steel frame was so arranged that the brick curtain walls between columns were needled and supported on the steelwork. Temporary bracing consisting of knee braces (attached to the bottom chords of the trusses and column flanges) and cable ties were placed to reinforce the structure.

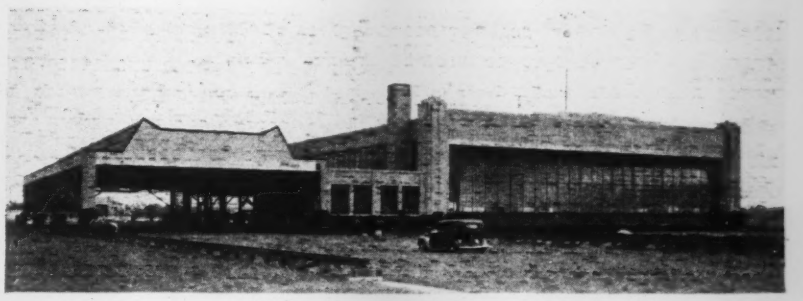
After the steelwork and bracing had been placed the entire structure was raised 30 in. in order to obtain clearance between the tracks, which were placed, generally in pairs, under the columns and column bases. When the raising operation was completed the tracks consisting of wood cribbing and 100-lb. railroad rails were placed. A rolling assembly consisting of 3-in.-diameter steel rollers, roller shoes and necessary cribbing was placed between the top of rail and the underside of the carrying frame at each column.

The larger hangar and attached buildings were moved on a total of 13 tracks a distance of 1,000 ft. to the east, at which point it was necessary to raise the buildings from the moving devices so that the tracks and roller assemblies could be set at right angles to the direction first moved. After the transfer of tracks and rolling assemblies had been completed the buildings were moved on 7 tracks a distance of 1,400 ft. to the north. Motive power for the moving operation was furnished by two winch trucks and sufficient rigging to obtain the necessary power. The path of the move was over the improved field of the United Airport, the maximum change in elevation of ground in this area being a downgrade of 3 ft.

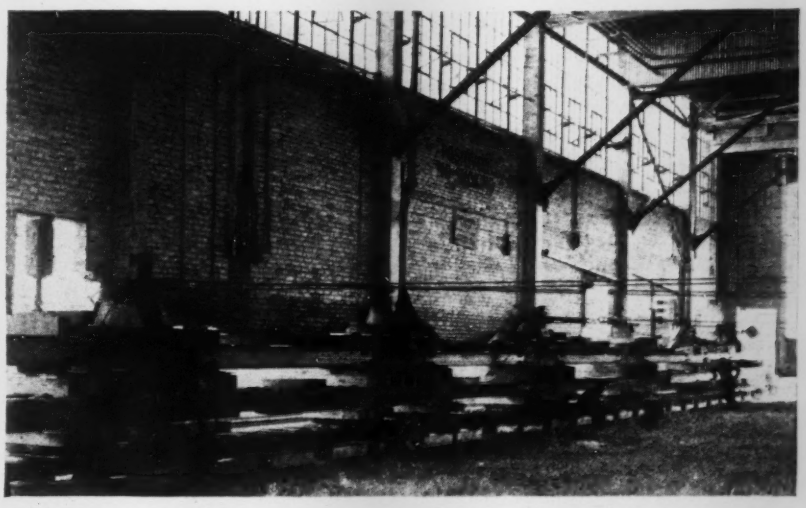
At the new site the structures were set to proper line and then lowered to prepared foundations.

A few of the more noteworthy conditions which were encountered were the relatively high concentrations of load which were adjacent to lighter loads, necessitating careful planning so that unequal settlement did not occur. The maximum column load of 80 tons occurs at the four corners of the main hangar which support the 127-ft. end trusses. At each of the four corners of the main hangar are wall-bearing masonry towers 40 ft. high and weighing 40 tons each. Attached to the west wall of the hangar is a brick chimney 50 ft. high weighing 60 tons.

The moving of the structures was performed by the Eichleay Corp., Pittsburgh, Pa., for whom the author was superintendent in charge.



War expansion puts skids under this 2,500-ton hangar group to move it 1,000 ft. ahead then 1,400 ft. at right angles to clear an area for new buildings for the Pratt & Whitney Aircraft Corp.



For moving, the building was supported on steel framing, with special blocking carrying the walls, then raised 30 in. to obtain clearance for rolling devices.

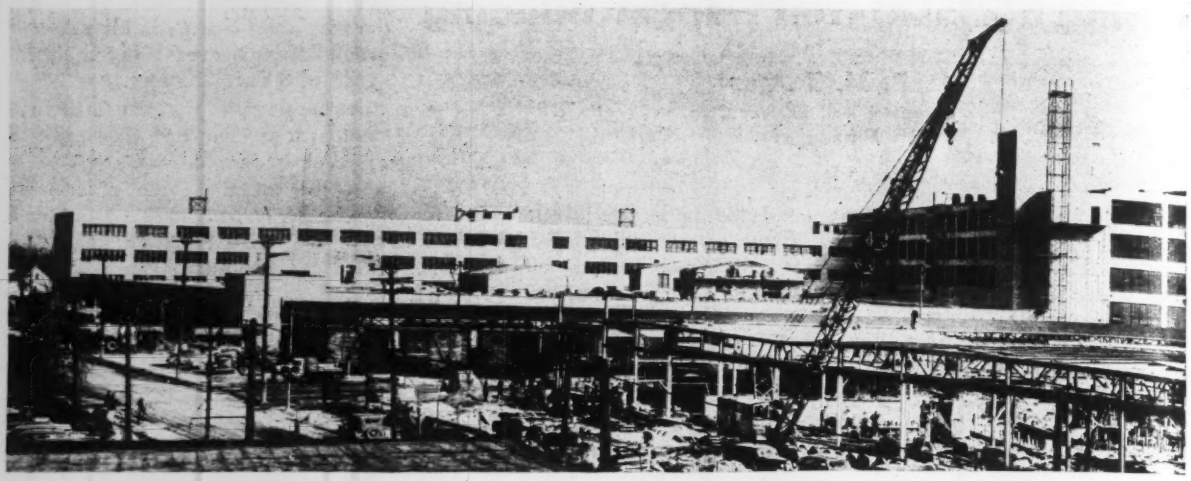


Fig. 1. Office and assembly building enclosed, test building being erected for Packard's Rolls-Royce airplane engine factory.

FACTORIES FOR DEFENSE

Packard Adds a Plane Engine Plant

***Contents in Brief**—In the three new buildings at the plant of the Packard Motor Co. where Rolls-Royce airplane engines will be built, three different framing layouts are used. Service facilities in one building are housed in penthouses, part above and part below the roof, utilizing long girders and rigid frames. A mezzanine carries the utilities in another building. Two of the buildings are connected by a trucking tunnel served by elevators. Column-less office space is lighted with continuous fluorescent units set flush in acoustical ceiling panels through which sprinkler heads protrude.*

UNLIKE most large industrial establishments, the plant of the Packard Motor Car Co. in Detroit is practically surrounded by developed residential districts. Vacant land for expansion is therefore scarce. And in contrast to most other automobile plants, Packard's buildings are largely of multiple-story type and reinforced-concrete construction.

Both of these facts are significant in connection with the new facilities that Packard completed last month for the manufacture of Rolls-Royce Merlin airplane engines—6,000 for Britain and 3,000 for the United States. For the three buildings required had to be spotted where land was available, and their one-story steel frames contrast sharply with their older neighbors. Furthermore, both in layout and in design detail the new building facilities, which cost $4,500,000 exclusive of equipment, include features that building designers will find interesting.

How the new buildings are fitted into the existing plant is indicated in Fig. 2, where the machine and heat-treating shop is shown at one end of the site while the motor assembly building (including a 4-story office wing) and the test-and-teardown building are near one another at the opposite end, and are connected by a tunnel.

It is interesting to note that Rolls-Royce engines for this war will be assembled in a building that occupies the site where Packard built the famous Liberty aircraft engines for the last war. As a matter of fact, the last of these old 1917 structures had to be torn down to make way for the new facilities.

Contrasting framing and layout

Although each of the three new buildings is of steel frame type with walls of brick, cinder block and continuous window sash, and with 15-ft. ceiling heights, the similarity ends there. Each has a different framing layout and each includes features not found in the others.

The machine shop is of simple 1-story beam-and-girder type. It includes the only basement in the project, an excavated area in which the heat-treating equipment foundations are built, so that the equipment itself will be at ground level. The relatively large area of this building, nearly 120,000 sq.ft., is necessary because 87 hours of heat treating will be required for each crankshaft.

The factory portion of the assembly and office building is a 1-story structure divided into 40 x 47-ft. bays spanned by Warren type roof trusses. Floors are 2-in. wood block on 5-in. concrete slabs, while the roof consists of a metal deck covered with 2 in. of insulation and built-up roofing. A distinguishing characteristic of this building is that all utility and service rooms are in five penthouses supported by special framing instead of being carried by the roof trusses. Two other enclosures that rise above the roof level are for elevators; one is tall enough to serve the five floors of an existing adjacent building, while the other is merely a machinery house for the elevator that lowers industrial trucks loaded with finished engines from the floor of the assembly building to the tunnel through

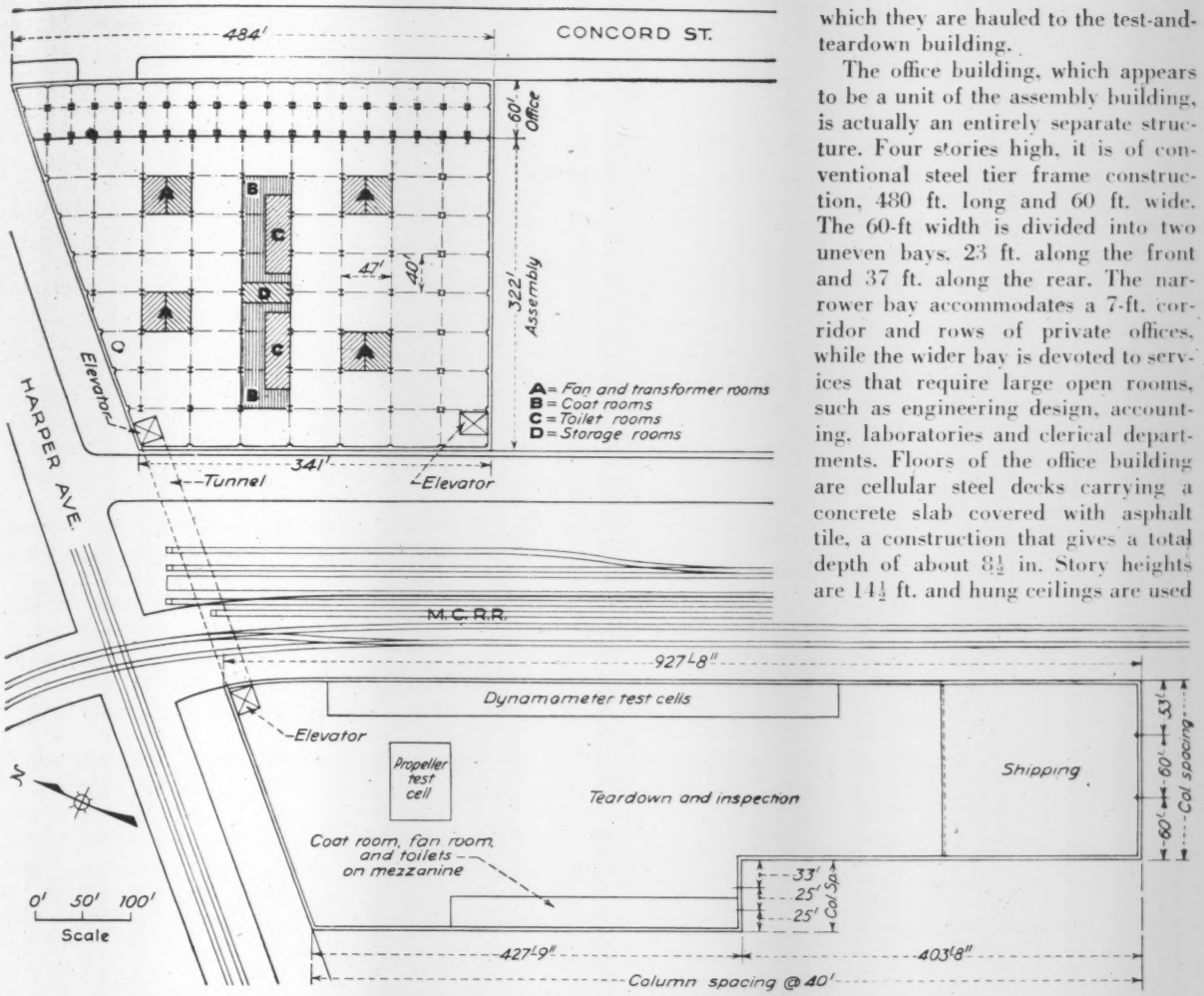


Fig. 3. Layout of assembly-office building and test-and-teardown building. The office section is 4 stories, while the factories are single-story but of quite different arrangement to accommodate the special manufacturing processes. Note the trucking tunnel that connects the two factories.

AIRCRAFT ENGINE TEST TEAR-DOWN AND REASSEMBLY AND SHIPPING
188,484 SQ. FT.
TUNNEL
144,300 SQ. FT.
AIRCRAFT FINAL MOTOR ASSEMBLY AND OFFICE BUILDING
SERVICE DOCK
AIRCRA MACHINE SH HEAT TRE
119,187 SQ. FT.

Fig. 2. Where the airplane engine buildings are located in the Packard plant. Of one-story steel frame type, except the office building, they contrast sharply with the multi-story concrete buildings of the motor car plant.

which they are hauled to the test-and-teardown building.

The office building, which appears to be a unit of the assembly building, is actually an entirely separate structure. Four stories high, it is of conventional steel tier frame construction, 480 ft. long and 60 ft. wide. The 60-ft width is divided into two uneven bays, 23 ft. along the front and 37 ft. along the rear. The narrower bay accommodates a 7-ft. corridor and rows of private offices, while the wider bay is devoted to services that require large open rooms, such as engineering design, accounting, laboratories and clerical departments. Floors of the office building are cellular steel decks carrying a concrete slab covered with asphalt tile, a construction that gives a total depth of about $8\frac{1}{2}$ in. Story heights are $14\frac{1}{2}$ ft. and hung ceilings are used on the second, third and fourth floors to conceal sprinkler and steam piping and lighting conduit. This hung ceiling is of a special design made up of perforated acoustical panels through which the sprinkler heads protrude, alternating with troughs for the fluorescent lighting tubes; three lines of these tubes are used in the private offices, one line over the corridor and nine lines over the wide bay that accommodates drafting, clerical and similar departments. All columns in the office building are furred with cinder block.

The third building of the group, the test-and-teardown building, has a function that is described by its name. Engines brought to it from the assembly building are mounted in one of 26 dynamometer test cells

Fig. 4. Tunnel in which industrial trucks will transfer engines from assembly to test building. Hydraulic elevators at either end raise or lower trucks to factory floor. Utility pipes are also carried in the tunnel.

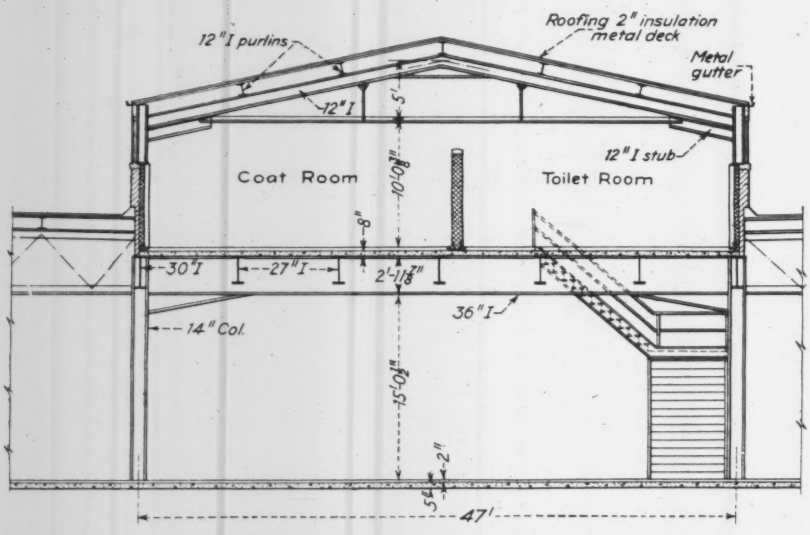


Fig. 5. Rigid frame bents are used for penthouse framing. Note that floor is not on factory roof but is carried on independent beams.

along one wall, test-run for a certain number of hours, then completely disassembled and each part inspected. The engines are then reassembled, tested again and sent to the shipping room on the south end of the building. Production bays in this building are 60 ft. wide while column spacing in the opposite direction is 40 ft. Instead of using penthouses as in the assembly building, the coat room, fan room and toilets of the test-and-teardown building are placed on a 50x 300-ft. mezzanine along the east wall.

Extra efforts have been made to reduce noise from the engines under test. A sound intensity of about 150 decibels will be cut to 90 by making all test cell walls of porous cinder block construction, and using acoustical ceilings; provisions are made for adding other acoustical materials to the walls and for placing sound-deadening baffles in the exhaust stacks if greater noise reduction becomes necessary.

The trucking tunnel

Two elements of the plant are worth special mention—the tunnel between the assembly and test buildings, and the penthouses on the assembly building. The tunnel, 255 ft. long, 14.5 ft. wide and 7.5 ft. high, is of reinforced concrete and of relatively heavy section because it passes under both a trucking street and the tracks of the Michigan Central R.R. Walls which are 12 in. thick near the assembly building increase to 18 in. under the street and to 30 in. under the railroad. The tunnel roof is uniformly 30 in. thick but under the railroad it is reinforced by closely spaced steel H-sections. A width of $2\frac{1}{2}$ ft. at one side of the tunnel is reserved for utility pipes, leaving space for two 6-ft. trucking roadways. Each trucking roadway terminates in an 8x25-ft. hydraulic lift platform at either end that raises or lowers the trucks to building floor level.

Rigid-frame penthouses

The utility and service penthouses in the assembly building are special in two respects—they replace the roof framing rather than being carried by it, and their enclosures are supported on rigid frame bents. As shown in Fig. 3, there are four small penthouses and one large one. Each of the small penthouses is divided into two rooms, one for ventilating equipment, the other for transformers.

The single large penthouse accommodates a coat room and toilet facilities at either end and a storage room in the center. Stairs rise from the factory floor at either end of each toilet room, and doors at the top landing give access to either the coat room or the toilet room.

The framing for all of these penthouses is similar to that shown in Fig. 5. Each of the small penthouses occupies a complete panel of roof 40x 47 ft., and is therefore supported by a column at each corner. The roof trusses that occur in other panels are replaced in this panel by rolled girder sections 36 and 30 in. deep, with their bottom flanges 15 ft. above the factory floor, the same clearance that obtains elsewhere in the factory. Floorbeams that fill in the panel are 27-in. rolled sections, framed over the 40-ft. span, and they support an 8-in. floor made up of cellular steel units, topped with a concrete slab. The finished floor is about 3 ft. below general roof level. Support framing for the large penthouse, which is one panel, 47 ft. wide, by six 40-ft. panels long, is the same as for the small penthouses.

The building columns at the penthouses are extended some 8 ft. above the general roof level to form the

Fig. 6. Drafting room in the office building is featured by a 37-ft. column-free width and by a ceiling combining acoustical panels and concealed continuous lines of fluorescent lights.

legs of rigid frames that support the penthouse roofs. As shown in Fig. 5 the rafter portion of these frames consists of 12-in. I-beams rigidly spliced at the peaks and resting on stubs of 12-in. I-beams at the haunches. These stubs give the necessary extra depth to assure rigid frame action. The roof construction is completed by 12-in. I-purlins that support an insulated metal roof deck. All drainage from the roofs of the penthouses is caught in metal eaves gutters and carried to downspouts at the columns.

Administration

The facilities of the Packard Aviation Division are financed jointly by the British and United States governments. The heat-treating building and the assembly and office buildings were designed by the H. E. Beyster Corp., Detroit, while the test-and-teardown building was designed by Albert Kahn Associated Architects and Engineers, Detroit. O. W. Burke Co., Detroit, and Barton-Malow were the general contractors. The general supervision of all work was under the direction of R. R. Rees, general plant engineer, Packard Motor Car Co.

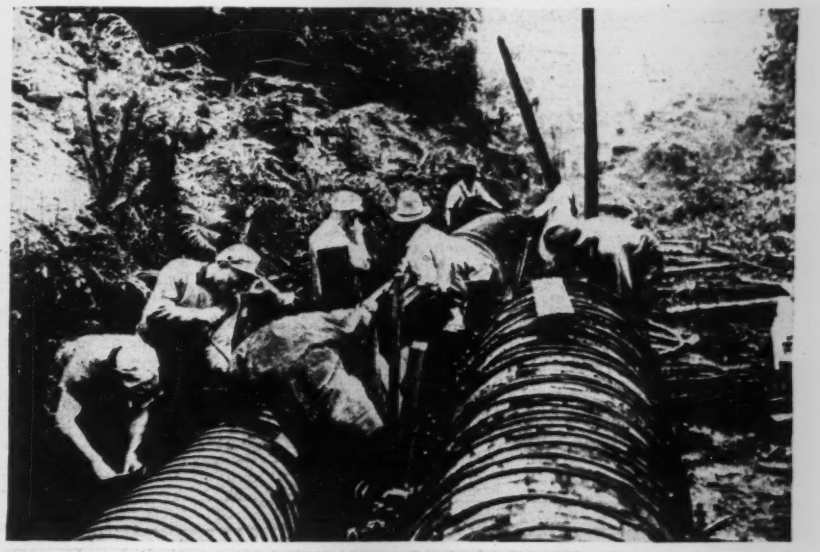
More Water for Defense Needs

SUPPLYING EVERETT, WASH., with sufficient water to meet normal needs plus the increased demands of stepped-up industries and airport construction calls for major additions to its supply system. These improvements, involving more than a million dollars of expenditures, are now going forward under one of the largest WPA undertakings of its type in the state.

The present supply for Everett is obtained from Lake Chaplain, which is about 25 miles east of the city limits. Fed by natural springs and a 7,000-ft. diversion tunnel from the Sultan River, the lake's storage capacity of 1.5 millions gallons is being increased to 4.5 mg. Water needed by the city, its pulp mills, canneries, and the Army airbase at Snohomish County Airport, will call for an increase this summer of some 20 mgd. over the 65 mgd. now being used. The increased storage capacity of the lake plus improvements being made to the supply lines will make it possible to supply 110 mgd., with sufficient storage to carry over the summer's dry period and the corresponding low flow in the Sultan River.

The capacity of Lake Chaplain is being increased by the construction of two dams. The main dam at the south end of the lake is being built to a maximum height of 44 ft.; it will be 815 ft. long. The smaller dam at the north end of the lake will rise to a height of 18 ft.

Improvements to the supply line from the Sultan River to the lake have been completed. This involved the laying of 2,150 ft. of 60-in. wood stave pipe. The installation of 33,000 ft. of new 28-in. wood pipe at various locations along the supply system is now going forward. Other operations involved in the installation of this pipe include the resetting of 50 air valves, and removal of 20,000 ft. of old wood stave pipe.



Rebuilding a 28-in. wood stave pipeline for the Everett, Wash., water system, whose capacity is being increased to take care of new industrial activity.

Cost of Snow Removal on Highway

REMOVAL OF SNOW from public roads by highway departments is thought to have begun in 1906, in Dickinson County, Mich., but by 1925 most of the northern or snow-belt states had organizations and equipment for such work, although much of the equipment was crude. This statement forms the opening of a paper by H. R. Moffitt, chief engineer of maintenance of the Pennsylvania highway department, presented at the annual meeting of the Association of Highway Officials of the North Atlantic States, held at Boston, Mass., Feb. 19 to 21. (*ENR*, Feb. 22, 1941, p. 313) As demands for open highways became urgent, many departments were handicapped by lack of legal authority, as expenditures for snow removal were not then considered as maintenance items. These conditions have almost disappeared. In the winter of 1939-1940, the 36 northern states reported to the U. S. Bureau of Public Roads a total expenditure of $20,969,988 on 232,615 miles. This information for the several states is presented in Table I, from which it will be seen that Pennsylvania's expenditures are 21 percent of total.

TABLE II—SNOW AND ICE SERVICE ON PENNSYLVANIA ROADS

	Season 1939–1940. Main Highways	Rural Highways	Borough
Miles on Program — 18,215.36	11,940.85	4,716.36	1,558.15
Snow Removal	$978,353.82	$1,084,704.60	$42,752.98
Ave. Cost per Mile	81.93	229.98	27.44
Percent of Total Cost for System	37.12%	67.38%	31.77%
Ice Control	$1,404,594.69	$333,406.39	$86,577.58
Ave. Cost per Mile	117.63	70.69	55.56
Percent of Total Cost for System	53.30%	20.71%	64.34%
Snow Fence: Purchase, Erecting and Dismantling	$247,258.67	$189,952.61	$4,809.77
Miscellaneous	5,092.37	1,797.07	429.02
Total	$2,635,299.55	$1,609,860.67	$134,569.30
Grand Total			$4,379,729.52

TABLE III—COMPARISON OF COST OF SNOW SERVICE AND GENERAL MAINTENANCE ON PENNSYLVANIA ROADS

Fiscal Year	Total Miles of State and Rural Highways	Total Miles on Snow Removal Program	Total Expenditures for Snow Removal	Average Expenditure per Mile: Snow Removal Program	Average Expenditure per Mile: General Maintenance
1935–36	38,032	15,375.26	$5,771,271.33	$375.36	$261.00
1936–37	38,034	16,729.20	2,967,210.80	177.37	357.00
1937–38	40,482	17,834.55	3,507,160.96	196.65	319.00
1938–39	40,498	18,576.67	4,894,842.59	263.49	351.00
1939–40	40,521.98	18,215.36	4,379,729.52	240.44	217.00
1940–41	*	19,236.06	**4,000,000.00	*	*

* Not available. ** Estimated.

TABLE I—SNOW REMOVAL AND ICE SERVICE IN 36 SNOW-BELT STATES

State	Snow Removal and Ice Treatment Supervised by	Comparative Average Seasonal Snowfall: 1938–39 Season	Comparative Average Seasonal Snowfall: 1939–40 Season	Snow Fence	Roads Cleared of Snow	Total Cost Snow Removal and Ice Treatment
		In.	In.	Miles	Miles	$
Connecticut	State	51.7	38.6	30	2,792	656,194
Maine	State	102.6	73.0	327	2,701	510,634
Massachusetts	State	54.4	50.1	63	2,039	1,275,652
New Hampshire	St. & Co.	111.2	89.4	162	4,440	827,361
New Jersey	State	28.3	27.4	110	1,602	630,000
New York	St. & Co.	83.1	82.0	1,272	11,831	2,771,232
Pennsylvania	State	41.8	45.5	2,429	18,215	4,379,730
Rhode Island	State	28.6	24.6	14	795	96,878
Vermont	State	99.7	78.2	122	1,749	475,458
Delaware	State	18.3	31.8	24	1,500	58,295
Maryland	State	25.6	35.4	195	4,200	208,968
Virginia	State	12.8	31.5	86	9,365	101,720
West Virginia	State	29.3	41.7	44	6,394	235,429
Illinois	State	20.4	23.0	349	13,379	808,451
Indiana	State	24.5	25.4	11	9,716	400,318
Iowa	State	37.9	35.6	1,610	9,587	756,500
Kansas	State	20.0	26.4	464	9,592	335,459
Michigan	St. & Co.	73.0	65.2	793	9,142	1,351,023
Minnesota	State	53.6	35.2	1,174	11,196	740,561
Missouri	State	18.5	28.5	333	15,582	445,858
Nebraska	State	29.2	31.4	818	8,694	205,154
North Dakota	State	34.9	26.2	530	6,637	61,876
Ohio	State	27.7	32.7	182	16,675	913,881
South Dakota	State	29.0	32.7	381	5,943	152,182
Wisconsin	State	54.4	44.1	1,238	9,982	879,287
Arizona	State	20.4	6.6	14	869	5,464
California	State	13.0	13.0	81	3,281	322,772
Colorado	State	69.1	64.9	83	4,635	173,943
Idaho	State	59.9	36.4	239	3,989	176,501
Montana	State	50.2	42.3	369	4,945	125,000
Nevada	State	31.0	24.6	28	2,317	53,983
New Mexico	State	30.4	28.8	7	2,950	42,523
Oregon	State	38.1	21.2	47	4,249	172,195
Utah	State	57.9	40.6	158	4,134	126,562
Washington	State	48.8	29.8	97	3,898	359,944
Wyoming	State	61.2	55.3	76	3,600	133,000
TOTALS				13,910	232,615	20,969,988

Pennsylvania experience

In 1921, Pennsylvania assumed responsibility for keeping 1,100 miles of road open for winter traffic, but for the 1940-1941 season it reached a total of 19,236 miles. Additional 13,000 miles of improved roads receive attention for placing anti-skid material on hills and curves after the programmed mileage has been cleared. During the past ten years this service has cost some $32,000,000, ranging from $1,086,000 for the mild winter of 1932-1933 to $5,771,000 and $4,380,000 for the severe winters of 1935-36 and 1939-40, respectively. In Table II is an analysis of the cost records, taking the 1939-40 season as typical. For that fiscal year the average cost of maintenance for all highways was $217 per mile and the average cost of snow removal was $240.44. Table III gives a comparison of the average cost per mile for snow removal and general maintenance for the six years 1935 to 1941.

Ailing Suspension Bridge Restored

D. B. Steinman and J. London

Robinson & Steinman, Consulting Engineers
New York, N. Y.

***Contents in Brief**—Generation-old Ohio River suspension bridge at Steubenville, Ohio, strengthened under traffic by new welded suspended spans and the restoration of corroded cables. Ingenious friction hitches held the cables taut while the rusted ends were cut out, replaced and reconnected to strengthened anchorages.*

A NOVEL FEAT of rebuilding and patching recently carried out has made a modern structure of the weakening 35-yr.-old suspension bridge over the Ohio River at Steubenville, Ohio. Without interrupting heavy traffic, virtually all of the steel structure was replaced except the suspension cable system and the towers, and they were extensively patched and strengthened. Categorically the operations were as follows:

The cables were cut at both anchorages and connected to strengthened anchorages; corroded cable wires at both ends were cut out and replaced; new stiffening trusses were constructed and a new floor was laid on a strengthened floor system; cable suspenders were substituted for rod suspenders; the towers were strengthened and modernized; and finally the bridge was changed from continuous and restrained seven-fold statically indeterminate design with center hinge to a modern two-hinged design. These changes increased the capacity of the bridge from H-15 to H-20 loading, the latter being the heaviest standard loading required in the specifications of the American Association of State Highway Officials.

Outmoded old bridge

The suspension bridge at Market St., Steubenville, Ohio, was built in 1904. As shown by Fig. 2, the bridge has a center span of 700 ft., two suspended side spans of 324 ft. and 276 ft., and 496 ft. of steel viaduct approach spans of trusses and girders on the Ohio side, giving a total length of steel structure of 1,796 ft. At the West Virginia end of the bridge, the stiffening trusses rest on a concrete anchorage, the top of which is a continuation of the roadway. The cables at this end dip slightly below the floor to enter the anchorage and are pinned to eyebar chains that are buried in the concrete. The Ohio end of the suspended spans rests on a steel rocker bent. The cables in the original structure also rested on this rocker bent, passing through saddles and dipping down sharply to tie to backstays of eyebar chains that are anchored in a block of concrete.

Steel towers, set on masonry piers in the river, carry the two 7½-in. cables which are cradled from 33-ft. spacing at the tower tops to 25-ft. spacing at the anchorages and at the center of the main span. Each cable consists of 1,498 No. 8 bright-steel bridge wires, divided into seven strands. The original stiffening trusses were of light steel construction and had been reinforced in 1924 after buckling failures (*ENR*, May 21, 1923 and May 22, 1924). The original 20-ft. roadway and 6-ft. side-

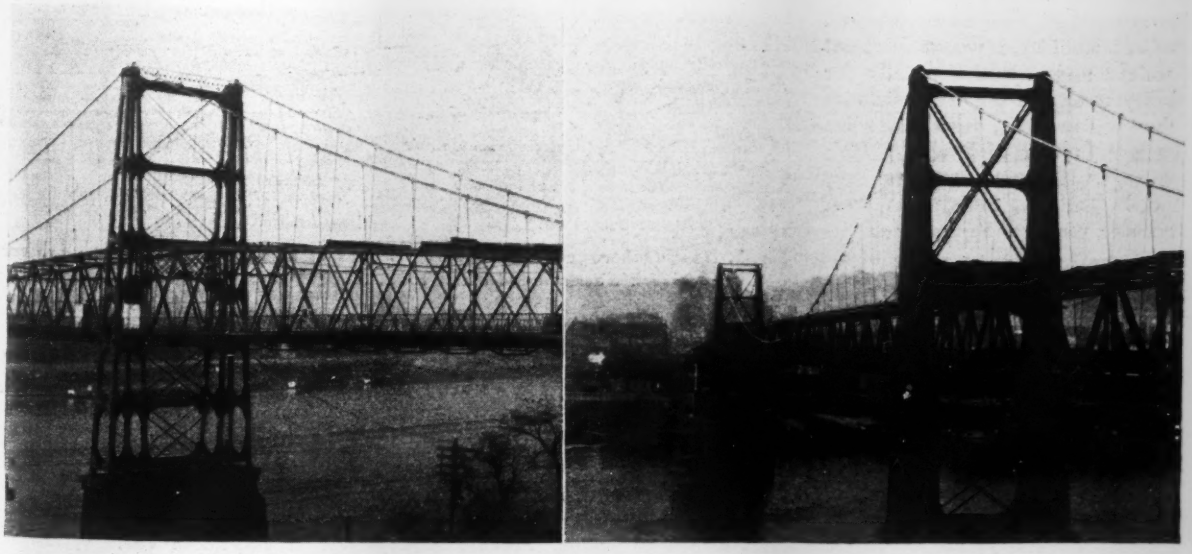


Fig. 1. Contrasting structure of original and strengthened Steubenville, Ohio, suspension bridge.

walk were of timber, and were carried by steel stringers and timber joists.

Obviously outmoded in design and capacity, the bridge called for improvement, and the owners, prompted by the success of the methods applied in the reconstruction of the East Liverpool-Chester Bridge (*ENR*, May 25, 1939), invited the contractor, in conjunction with consulting engineers, to investigate the feasibility and cost of repairing and modernizing their bridge. The proposed work was found practicable, required materials were collected and preliminary work started. This disclosed deterioration. The strand ends of the south cable, which were buried in the concrete anchorage, were uncovered and found to be in a state of corrosion that necessitated replacement of the defective material. Subsequent inspection revealed similar defects in the ends of the north cable that also required replacement of material. The replacement of these corroded parts of cable presented a unique problem, and its solution is a credit to the ingenuity and resourcefulness of the contractor, who performed the task without interruption of traffic and without exceeding the total estimate of cost for the reconstruction work as originally contemplated.

Anchorages and towers

An analysis and inspection of the substructure indicated that the Ohio cable anchorage did not quite measure up to the requirements of modern practice for an H-20 bridge. Though this anchorage had never showed signs of instability, it was rather light in weight and depended greatly for stability upon the passive resistance of the sand in front, especially when submerged under high water. This anchorage was also designed to carry a four-legged steel tower at the rear to act as a pier for the approach viaduct. To improve the stability of the anchorage, this steel tower was inclosed with 400 cu.yd. of concrete doweled to the original concrete. This adds weight at the rear of the anchorage, affords increased resistance to sliding and reduces the pressure on the piles under the front end. The steel tower, moreover, required reinforcement.

The original eyebar backstays on the Ohio side were overstressed and were each supplemented by 18 1½-in. square bars, fastened at their lower ends to girders that were buried in the new concrete.

The masonry cable bent pier is supported on timber piles that are within the range of variation of river level. To remove doubts about the condition of these piles, a test pit was dug, exposing several of the piles, which were found to be perfectly sound. To protect this pier against possible scour, a 52x59-ft. elliptical ring of 20-ft. sheetpiling was driven around the base, inclosing a 2-ft. concrete mat on the surface of the ground. A pair of 5x7-ft. concrete struts was placed between the anchorage and this ring to utilize the resistance of the huge mass of inclosed material to provide additional stability for the Ohio anchorage. The cable bent itself was reinforced by plates welded to the original material, and the pin bearings at the base were extended to reduce the bearing pressure.

The masonry piers for the main towers were not changed, but the towers were strengthened. Each leg of the old towers consisted of four columns forming longitudinal and transverse A-frames. The transverse A-frames of each leg were reinforced with solid ⅜-in. plates, stiffened with angles and welded into place. The changed appearance of the towers is clearly shown by Fig. 1. Work on the remaining superstructure can be divided into repairs to the suspension cable system and reconstruction of the suspended spans.

Cable repairs ingenious

That part of the north cable that was buried in the concrete of the West Virginia anchorage was found to be in an advanced stage of corrosion between the splay point and the strand shoes. The corroded wires had all been in direct contact with the concrete. On the other side of the splay point, where the cable had been wrapped with steel wire, the cable wire was found to be in perfect condition although the wire wrapping was badly corroded, and broke in many places while being removed. The eyebars in the anchorage, as far as they were exposed, were found to be in practically perfect condition.

A wire-by-wire survey of the corroded part of the cable showed that

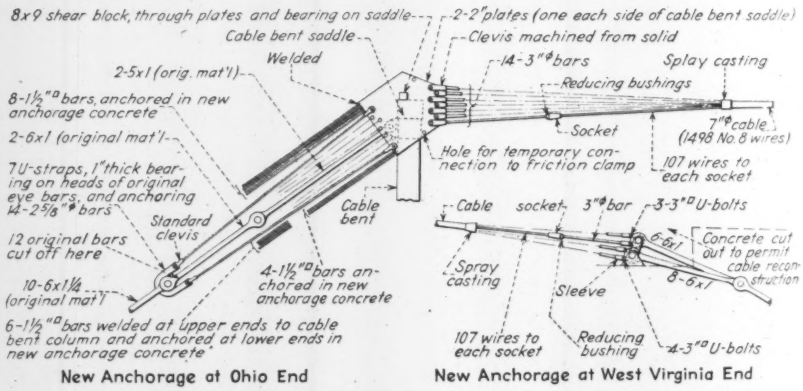

8x9 shear block, through plates and bearing on saddle
Cable bent saddle
Welded
2-5x1 (orig. mat'l)
8-1½"□ bars, anchored in new anchorage concrete
2-6x1 (original mat'l)
7 U-straps, 1" thick bearing on heads of original eye bars, and anchoring 14-2⅝"ϕ bars
12 original bars cut off here
10-6x1¼ (original mat'l)
Standard clevis
Cable bent
4-1¼"□ bars anchored in new anchorage concrete
6-1½"□ bars welded at upper ends to cable bent column and anchored at lower ends in new anchorage concrete
New Anchorage at Ohio End
2-2" plates (one each side of cable bent saddle)
Clevis machined from solid
14-3"ϕ bars
Splay casting
Reducing bushings
Socket
7"ϕ cable (1498 No. 8 wires)
Hole for temporary connection to friction clamp
107 wires to each socket
Cable socket
3"ϕ bar
3-3"□ U-bolts
6-6x1
Concrete cut out to permit cable reconstruction
8-6x1
Spray casting
Sleeve
107 wires to each socket
Reducing bushing
4-3"□ U-bolts
New Anchorage at West Virginia End

Fig. 3. New anchorage systems replaced ends of corroded cables that were cut out. New work was inserted under load.

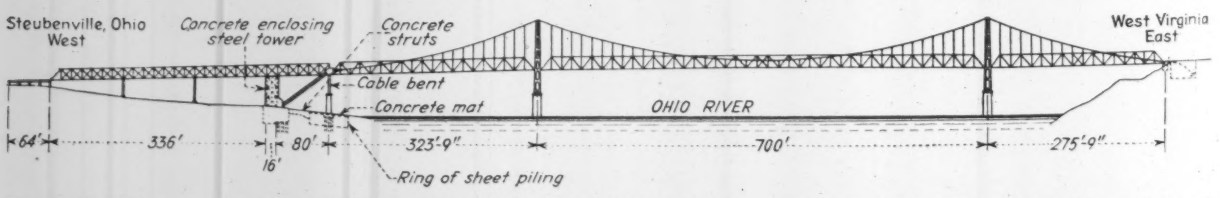


Fig. 2. Elevation of reconstructed Steubenville suspension bridge. Peculiar arrangement of suspension cable system at Ohio end introduced one of the main reconstruction problems.

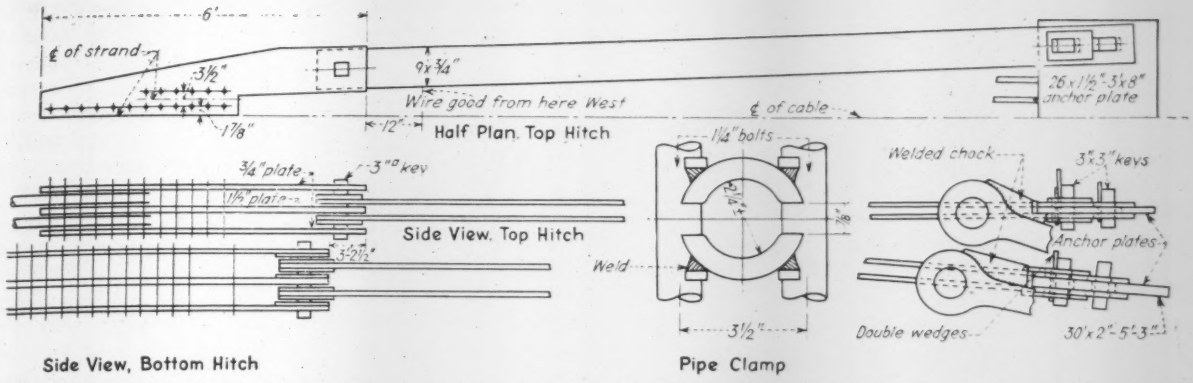


Fig. 4. Diagram of friction hitch and tie backs that gripped and held the cables taut while the rusted ends were cut off and replaced. Other illustrations of these hitches are shown in Fig. 5.

sufficient wire remained to carry the bridge with an ample factor of safety, but it was evident that complete replacement of this part of the cable was required.

It was, therefore, decided to cut the strands one at a time beyond the region of corrosion, socket the half-strands and anchor these sockets to the original anchorage eyebars, Fig. 3. The sockets were forged of steel, tapered to receive the broomed wires. The wide ends of the sockets were extended to take an internal thread and also to provide a hole for receiving the molten spelter. Threaded reducing bushings were screwed into the sockets for connection to 3-in. nickel steel bars which, in turn, were connected in pairs by threaded sleeves to U-yokes or bolts of 3-in. square nickel bars. These yokes were passed behind the pins in the anchorage eyebars that originally held the strand shoes.

To permit the strands to be cut and the new cable connections to be installed, the contractor designed and built an ingenious temporary friction hitch to grip the cable beyond the splay point and connect by flat tiebars to heavy wide plates which bore on small shoes or chocks welded behind the eyebar heads of the anchor chain. This friction hitch was designed to perform several functions: (1) It straddled the cable so as to afford minimum interference with work on the strands; (2) it relieved the corroded wires of most of the cable pull; (3) it permitted the strands to be cut one at a time without endangering the safety of the bridge, and (4) it prevented the cut strand from losing its stress in the main cable. A diagram of the assembly that was worked out is given in Fig. 4, and Fig. 5 shows it installed. The forked plan of the hitch, as shown, left the lengths of strands to be repaired fully accessible for the repair work. Also, it will be noted, the assembly consisted of two similar units one set on top of the other.

As shown by Fig. 4, the original strand shoes had been set in two tiers, the upper tier anchoring three strands and the lower tier anchoring four strands. Each tier of strand shoes thus subtended two parallel layers of half-strands. A unit of the friction hitch consisted of three plates, set between, above and below these two layers of half-strands; one unit for the top three strands and another for the bottom four strands. The clamping action was provided by 1¼-in. heat-treated bolts passing through the three plates. Twelve bolts were used for each strand. The circular shape of the half-strands was maintained by lengths of split 3-in. pipe set between the bolts. It was found necessary to go over these bolts frequently at first to maintain proper tension in them. The flat tiebars back to the eyebar anchors were connected at their ends to the anchor plates by square pins in the form of wedges, which were driven after assembly of the friction hitch to develop stress. A similar set of friction hitches was installed for the south cable at the West Virginia anchorage, which was also in a badly corroded condition.

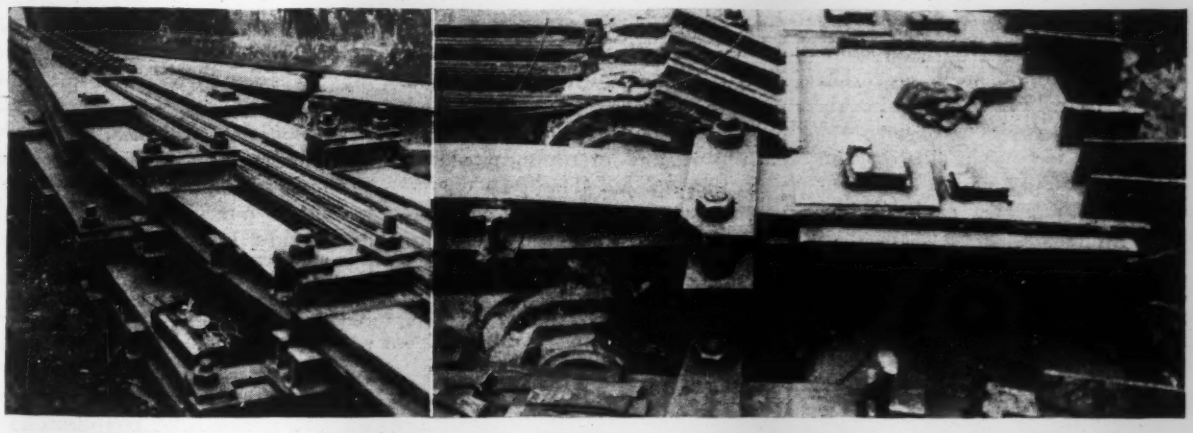


Fig. 5. Friction hitch in place on south cable at West Virginia anchorage. Details of the hitch are shown in Fig. 4

In the meantime experiments were carried on to determine the practicability of socketing strands in a horizontal position, and to develop a method of treating the old wire for most effective bond. Several trial sockets were poured in a horizontal position, tested for strength and the cones cut open for inspection. From these experiments, the following procedure was evolved for best results: The wires were cleaned with dry coarse oilstones and emery cloth and then were broomed carefully to avoid bunching, which might impede the flow of spelter; finally the wires were moistened with acid to promote bond with the spelter. The sockets were preheated with a blowtorch to prevent premature congealing of the spelter; the spelter was made hot enough to char a pine splinter quickly without ignition (corresponding to a temperature of about 970 deg.), and bottom-pour ladles were used to eliminate oxidized Spelter. Spelter was poured into the sockets through the holes near the wide ends. Due to cramped working conditions, it was often necessary to pour the spelter through funnels and chimneys leading to the holes. The wide ends of the sockets were dammed by circles of sheet iron tack-welded to the bushings.

After all the strands were socketed, the 3-in. bars (Fig. 3), which have right and left threads, were tightened to a uniform tension of about 12,000 lb. per sq.in. by means of special Stillson wrenches, and the bolts in the friction hitches were loosened to throw the entire cable load on the new cable material. The temporary cable hitches were then removed.

Repairs at the cable bent

Inspection of the cables at the rocker bent also revealed, in addition to poor workmanship, corrosion that necessitated replacement of cable material. The cables were corroded for several feet each side of the rocker bent saddles and at their connections to the eyebar chains in the backstays. Several of the strands had been twisted through 180 deg. in an apparent effort to take up excess length. To remedy these conditions it was decided to replace the cables in the backstays and in the first panel of the suspended spans with structural steel in the following manner (see Fig. 3).

A 2-in. plate was placed on each side of the two cable-bent saddles, provided with a series of holes at each end for connection to the backstays and to the new cable connections. The vertical reactions from these plates are transferred into the cable bents by 72-sq.in. shear blocks, which rest on top of the saddles and pass through square holes just above the centers of the plates. The original eyebars in the backstays connect to these 2-in. plates by bars and clevises connected to U-yokes passing around the strand shoe pins. The new material in the backstays is connected to the 2-in. plates by welding. The cables in the side span were cut about 16 ft. from the cable bents, and one-half strand at a time was socketed and connected to the 2-in. plates by bushings, bars and clevises in an arrangement similar to that used at the West Virginia end of the bridge.

To make up for the sections of the cables cut for socketing, a temporary friction hitch designed to take one-seventh of the cable load, was placed on each cable and connected to the 2-in. plates.

Chambers were left in the West Virginia anchorage, and hoods placed on the Ohio ends of the renovated cables to afford easy inspection of the new cable connections.

Installing new suspenders

As stated previously the original suspenders of steel bars were replaced by rope strands. During this process the main cable bands were removed one at a time, all wrapping stripped off the cables and the cables opened up with bronze wedges for inspection. Many instances of corrosion and loose wires were found but these defects were always confined to the two outer layers of wire and were readily repaired by splicing in new lengths of wire under tension produced by sleeves with right and left threads. The original cable bands, each consisting of two bent plates, were retained but their grip on the cables was augmented by the addition of a pair of cast steel plates bolted around the original cable band. The repaired cables were filled with paint and rewrapped with No. 9 galvanized wire. The cable bands were waterproofed with mastic.

Suspended spans rebuilt

Before starting work on the suspended spans, it was necessary to correct their camber. The original stiffening trusses had an expansion joint at the center of the main span which permitted a sharp down-pointed cusp to form in the profile. A proper camber curve was run across the bridge with points marked on the 1½-in. round bar suspenders. The bar suspenders were then cut one at a time, shortened and spliced to correct length by welding. Later on these bar suspenders were replaced by 1½-in. wire rope strands, pre-stressed and socketed in the shop as described above.

The original stiffening trusses were replaced with new Warren-type trusses of completely welded construction with members of rolled sections. The top chords are 14-in. wide flange beams with webs vertical, the bottom chords are 12-in. wide flange beams with webs vertical, and the web members are 10-in. wide flange beams whose flanges were also placed in a vertical plane.

As the welded bottom chords are free from rivets and splice material, their lower flanges form ideal rails, and the contractor suspended a light movable platform from them in each span to aid in his underfloor work. These platforms have been left in place for convenience in future inspection and maintenance. A new top lateral system of 6-in. H-beams was installed. In view of the great stiffness and continuity of the floor, a bottom lateral system was not required.

The original timber floor and its steel stringers were removed and replaced with Neeld-type floor sections consisting of sheetpiles laid flat with the web uppermost and welded together. The troughs were filled with concrete and the floor sections paved with a bituminous wearing surface after placing. A complete description of this floor and method of placing has been given in a previous article (*ENR*, May 25, 1939). The Neeld floor was also installed on the approaches.

The floorbeams were reinforced by welding a 6-in. H-beam to the top flange and a 14-in. I-beam to the bottom flange.

The work was carried out by C. M. Neeld of Pittsburgh, Pa., as contractor. Robinson & Steinman of New York acted as consulting engineers, with J. London in charge of office work and D. G. LeTourneau as resident engineer.

BUILDING DESIGNERS' LIBRARY

Heating Industrial Buildings With Direct-Fired Units

H. A. Pietsch
Engineer, Heater Department
Dravo Corporation, Pittsburgh

***Contents in Brief**—Low initial cost and operating economies resulting from lack of standby, radiation and line losses, combined with automatic operation, have resulted in the recent development of direct-fired oil or gas burning heaters for industrial plants.*

DIRECT-FIRED oil or gas burning heaters, although comparatively new, are being recognized more and more as one of the most effective means of heating industrial-type buildings. This recognition results from many factors. In the majority of cases the initial cost of this type of equipment and of its installation is lower. The cost of operation is lower as overall efficiencies are higher, there being no standby, radiation or line losses. Direct-fired heating units operate on temperature-controlled demand and heat is distributed almost instantly. The unit shuts off when this demand has been satisfied. Upon official tests this type of heater has shown an overall heat transfer efficiency exceeding 85 percent. Thus, comparing this type of system with others, it can have as much as 25 percent advantage in over-all fuel expense.

The cost of maintenance is low due to simplicity of design, no freeze-up and no leaks. The units are completely automatic in operation and skilled operators are not required.

Flexibility is another advantage since a number of small independent heating units reduce the chance of shutdown as compared with a single large plant. Also, under normal conditions direct-fired heaters can be installed and placed in operation within a month, and likewise they can be easily and quickly moved to a new location. This matter of flexibility is of particular interest in connection with the rapid amortization of plants engaged in national defense production. Such plants may be relatively inactive after the present emergency, which emphasizes the importance of using heating equipment involving low initial investment, low maintenance and easy removal.

The units can easily be used for ventilation, and in conjunction with filtering, cooling or humidifying equipment. They are also easily converted from oil to gas firing, or vice-versa.

Heater design

Direct-fired heaters are similar to modern boilers in that a large portion of the heating surface is exposed to the fire and receives its heat principally by radiation from brickwork, flame and gases. The secondary or convection surface of the unit generally consists of a tube bank with the gases of combustion passing inside. The colder air on the floor of the building is taken by supply fans and forced over the tube bank, then over the primary surface and to the discharge outlet. Proper fuel and air ratios are maintained, assuring highest possible efficiency, or fuel utilization.

Installations are principally of a floor type placed within the heated space. The capacity of the units ranges from 750,000 B.t.u. to 1,500,000 B.t.u. per hour output. Air handled ranges from 9,000 cfm. to 18,000 cfm., depending upon the output and discharge air temperature desired. The number of heaters depends upon: (1) building construction, (2) temperature differential, and (3) ventilation required. The units can be placed against the outside walls, or along the center line of columns.

Air is discharged in most cases at the top of the units from adjustable louvered nozzles, at a velocity of 1,800 to 2,200 ft. per min. The distance of throw of warm air depends upon: (1) initial velocity, (2) obstructions encountered, (3) height of building, and (4) induction of cooler room temperature air into the warm air stream. For estimating purposes, it can be said that for every 100 ft. of velocity, air will travel 8 to 9 ft. Due to the method of taking cold air off the floor and discharging warm air at a distance of 10 to 12 ft. above the floor a positive circulation is obtained with a minimum temperature differential between floor and roof.

If floor space is not available, the units can be suspended from side walls or from columns and roof trusses throughout the building. It is recommended if this type is used that a return air duct be run to within a few feet of the floor so that the colder air is taken from this level.

In very large buildings, where floor space is not available, it may be desirable to provide heater rooms where large heater units can be installed. In this type of installation it is necessary that the warm air be distributed throughout the plant by a duct system. There is no need of providing a return duct system if the heater rooms are an integral part of the building. Generally, the fan room is provided with the necessary opening for air to return directly from the heated space. When the heater rooms are in the basement of the building, the basement acts as a plenum and the air is returned from the main first floor area by means of stairways, elevator shafts, and grilled floor openings.

Distribution of air

Warm air distribution ducts may be either the underground concrete

or overhead sheet metal type. The duct system is designed by the equal friction method, or static regain method, and for velocities in the main branches from 2,000 to 3,000 ft. per min. When the heater rooms are placed on first floor level and floor area of building is large, underground concrete ducts are generally best. When this system is used, all the main branches of the duct should slope towards the heater room to permit draining of water into a central location where a sump pump is located. The ducts can be made of concrete, trowel-finished, or brick faced with mortar. A coarse fill should be placed immediately surrounding outside of duct to permit draining of water. Outlets can be provided at columns to discharge air horizontally at floor at a velocity not exceeding 750 ft. per min.

Where the heater room is installed in the basement, a sheet metal duct system is generally installed along the ceiling of the basement with outlets located at the base of first floor columns.

Fuel and firing

The type of fuel used depends upon cost per B.t.u., availability and quantity used, and labor costs involved. The comparative cost of the various fuels and availability must be determined for each installation. The quantity used depends upon the maximum B.t.u. loss of building, degree days, hours of operation, design temperature, over-all efficiency of heating unit and heating value of the fuel. A thorough study should precede the selection of any particular fuel, as in some cases the use of the cheapest fuel may not be justified. As an illustration, bunker "C" fuel oil is generally cheapest on first cost but requires expensive preheating equipment. And if coal is considered, labor for firing and ash handling must be figured.

Fuel oil distributing systems for light fuel oils from industrial type No. 3 to No. 5 free flowing oil at 0 deg. for test need only a single pipe system. The main oil line is run from fuel oil tank to pumps throughout plant and with branch outlets to each unit or heater room. A bypass is placed in discharge side of pump and returned to fuel oil tank. A back-pressure relief valve is installed in this line of sufficient size to relieve all excess oil, and set at a predetermined pressure.

The distribution of heavy fuel oil is more complicated. This oil requires preheating and the total heat required can be classified as follows:

1. Heat required for fuel oil tank car depends on the sensible heat necessary to permit the oil to flow, plus the heat loss from the tank car while unloading. The maximum design temperature should be figured at 0 and 125 deg. F., and time limit for unloading should be figured on 3 to 5 hr., depending upon size of tank car. Standard fuel oil tank cars are 8,000, 10,000, 12,000, 15,000-gal. capacity.

2. Heat for fuel oil storage tank depends upon heat loss of tank. The fuel oil temperature in storage tanks should be maintained between 90 and 125 deg. F.

3. Heat required by fuel oil preheater depends upon the sensible heat required. Oil should leave preheaters at temperature of 160 to 180 deg. F.

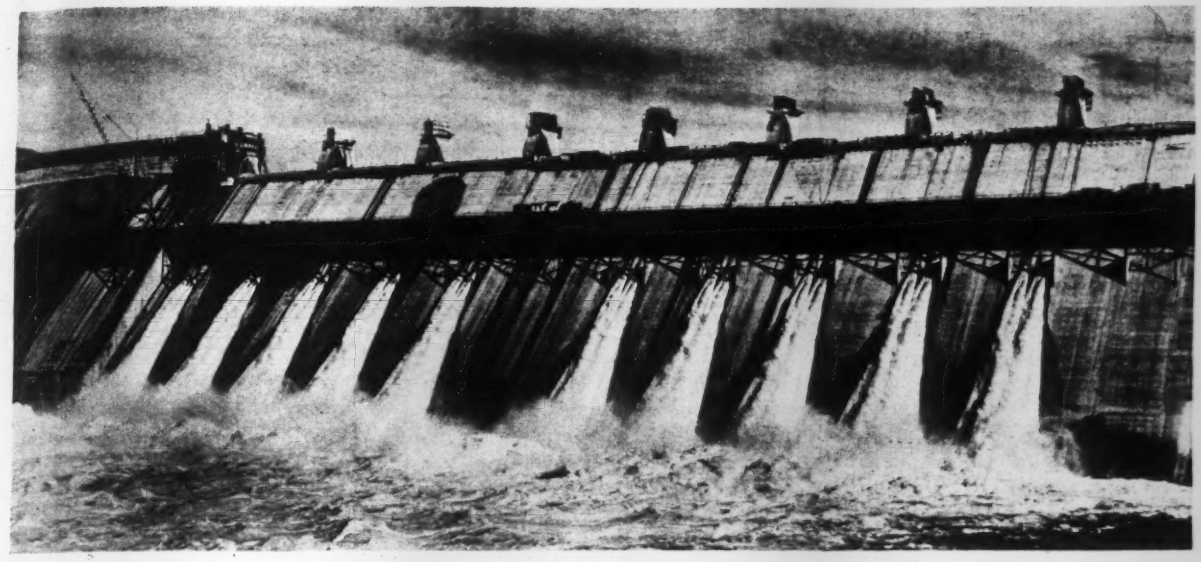
4. Fuel oil circulating in the pipe loop need not be preheated if the total length of piping does not exceed 150 to 200 ft. and is well insulated. This piping system should be a continuous loop so that constant circulation of fuel oil is possible. This loop should extend as close to the burner as possible to permit circulation of hot fuel oil adjacent to burner. Where the length of circulating pipe loop is longer than mentioned above, means of heating the loop should be provided.

For burning light fuel oils, the pressure atomizing type of fuel oil burner is generally used. For the burning of No. 5 fuel oil and heavier, the mechanical atomizing oil burner or rotary type is used. Operation of burners for all types of oil that do not require preheating is generally "on-off." Operation of burners for heavy fuel oil which requires preheating is generally "high, low or modulating."

The types of gaseous fuels that can be burned in direct-fired heaters can be classified as natural, coke oven, manufactured and propane. In most cases, industrial plants have high gas pressure available, and in order to save piping costs this high pressure is maintained in main gas supply lines, but is reduced at each individual unit by means of a suitable gas pressure regulator. The gas burner is generally multi-jet inspirator type and operates on 4 to 16-oz. pressure.

Large industrial type direct-fired unit heaters are generally equipped with individual induced draft fans, thus eliminating the uncertainties of natural draft. Due to this fact, it is not necessary to run the exhaust flue stacks above the building roof to assure positive venting of unit. Often the stack is merely run through the wall, extended a few feet vertically, and weather-capped.

Unit heater installation along the walls of an ordnance plant 330 ft. wide.



During the summer water passed through the dam in 8½-ft. pipes. The traveling derrick at the left was used for placing the final concrete in pier tops and also for setting up falsework for concrete arches for the roadway across the crest. Drum gates are in their lowered position.

Grand Coulee Dam Nears Completion

***Contents in Brief**—The job of placing almost 11,000,000 cu. yd. of concrete in Grand Coulee Dam is to be finished about March, 1942. Construction is under way on the 11-span concrete-arch highway bridge across the spillway. Of three 108,000-kva. units now being installed in the west powerhouse, the first was scheduled for operation early in September, the second in December and the third in March or April next. Bids on the next three 108,000-kva. units were received in July.*

GRAND COULEE DAM, frequently referred to as the largest structure ever built by man, is nearing completion. Before the end of this year, the first two 108,000-kva. hydroelectric units, one-third larger than the largest heretofore constructed, are to be delivering power and by March of next year final items are to be finished in the contract held by Consolidated Builders, Inc., for completion of the dam. Power-generating equipment in the west powerhouse is being hurried into serviceable condition presumably as a means of making energy available for defense industries, but no plans have been announced for awarding contracts for the proposed pumping plant (twelve 1,600-sec.-ft. units) or going farther at the present time with the two dams in the Coulee or other parts of the irrigation development with which it is proposed to bring water to some two million acres in the Columbia Basin. (In those phases of the project pertaining to irrigation, surveys and studies are about all that are expected until there is some decrease in the urgency of national defense expenditures.)

When it is decided to build the powerhouse on the east bank (for which foundations were put in under the earlier contract on the dam) another aggregate washing and screening plant will be required to replace the plant dismantled when the present contractors had prepared sufficient aggregate. In each powerhouse the plans call for 9 units of the same size; that is, 108,000-kva. generators driven by 150,000-hp. water wheels. In other words, the installed capacity of eighteen main units in the two powerhouses will total 1,944,000 kva.

Work under way during the summer included construction of the eleven concrete arches, each of 135-ft. span, that will take the 30-ft. roadway across the crest of the dam, installing machinery in the west powerhouse, construction of elevator houses that open out on the dam crest at the tops of access shafts, grouting slots in the dam, erecting a 150-ton traveling crane on the crest, construction of two large electrical switching yards and incidental work such as improving the main access road which follows the west bank below the dam.

Slides on this west bank have so frequently menaced rail and highway routes that almost 1½ million cu.yd. was removed in this summer's endeavor to provide a means of access that would not be interrupted.

The five slots in higher portions of the dam that were left open to take up any "twist" that might occur are being filled with concrete in successive 50-ft. lifts. These slots, 7½ ft. wide, divide the structure into separate monoliths free to twist and deflect under forces that otherwise might cause cracking. At the outset these slots were filled with sand separated into successive 50-ft. lifts, and a waterstop on the upstream face prevented entrance of water.

To allow for deflection under water pressure, the filling of these slots with concrete has progressed only as the reservoir level has raised. Concrete in the slots has been kept about 100 ft. below reservoir surface.

Of the mass concrete in the dam proper, totaling 10,019,690 cu. yd., 4,236,920 cu. yd. was placed by the previous contractor and the remainder by Consolidated Builders, Inc. Other items contracted or included in work now projected bring the total to 10,501,000 cu.yd.; items planned for later addition will increase the total figure, roughly, to 11,000,000 cu. yd.

The record rates for concrete placement, which are being used frequently for comparison with other jobs, are as follows:

Year, 1939	3,638,815 cu. yd.
Month, October, 1939	536,264 cu. yd.
24 Hour, May 25, 1939	20,684 cu. yd.

On either end of the dam it is planned to have a traveling crane operate along the crest from abutment to spillway edge. These cranes will move on 170-lb. rails laid on 27-ft. gage and are for operating penstock gates and other work related to power plant operation. The crane for the west end was assembled while the first power units were being put in; the east end crane has not yet been ordered.

Spectacular spillway

The 11 drum gates in the spillway crest that will control the overflow have been assembled in place and operating mechanism was being installed during the summer. The automatic controls that will regulate the height of these drum gates, and hence will control the amount of water permitted to pass over the dam, are being mounted on the reservoir side. Thus the reservoir is to be maintained at a constant level, and the flow released ordinarily will be the rate at which water flows into the reservoir.

The spillway is designed for a flow of 1,000,000 sec.-ft. which, with the heads expected, will require that as much as 32,000,000 hp. be dissipated largely in the stilling basin formed by a concrete bucket of 50-ft. radius at the toe of the spillway. This bucket is tangent to the 0.8 slope on the face of the dam and also to the 1:1 slope in the downstream channel. The lip of the bucket is at El. 900.0 or just 360 ft. below the spillway crest. This bucket has an optimum radius, determined by model studies, for the purpose of turning the water upward to form a high boil which is expected to dissipate the energy most effectively. Nevertheless, the large amount of power to be expended centers a good deal of interest on the condition of the concrete in the bucket after it has been some time in this service.

As a result a caisson is to be built to afford access to this bucket for inspection in periods of low flow. Plans are now being made to construct a hydraulic model of the caisson on a 1:60 scale on the east side of the dam. With this model it is proposed to determine the best means of handling such a caisson in the turbulent water of the bucket. This model is to be kept for an action display in the demonstration laboratory that operates on the east bank.

Installing the generating equipment

A center of interest at the dam during the summer has been the installation of generating equipment. The record size of the units has resulted in particular care in assembly operations. The water wheels, whose diameters are 16 ft. 5 in., are designed for operation under heads ranging from 275 to 355 ft. (average 330) and have a rated capacity of 150,000 hp. Hanging suspended, as they do, at the lower end of a shaft 74 ft. long, it is notable that the labyrinth seal rings that prevent escape of water around the runner have a clearance of only 0.015 in.

The rotor for the generator, weighing 527 tons, is keyed to the shaft with a shrink fit made in the field. The spider around the hub weighs 65 tons, consisting of a 50-ton hub in a single casting to which the ends of the arms were attached after the hub was fitted to the shaft. In making the shrink fit, temperature of the 50-ton hub was raised by electric heaters to such an amount that the diameter of the bearing was expanded to about three times the normal clearance; that is, by heating the hub the 0.015-in. clearance was increased to 0.045 in. The powerhouse crane then lowered the hub into place on the shaft and as cooling occurred, the hub diameter decreased to the prescribed size and fit.

A feature of major interest in this assembly is the thrust bearing at the top of the unit, which carries a moving load of about 1,000 tons. These bearings, although larger than any before built, use the usual principle of oil film between the rotating bearing plate and the segmental stationary blocks that carry the load. Guide bearings are located above and below each generator rotor. The one above has 16 shoes and the one below 8 shoes, both using the principle of thrust bearings in which an oil film separates the rotating from the thrust-receiving elements. The third and heaviest guide bearing is in the crown plate of the turbine.

A significant item in the national defense importance given to large generating units is that the contract covering the first three units now going in allowed 1,050 days for construction and installation. On the second group of three units duplicating this first order, the time allotment is only 650 days for the first unit, 710 days for the second and 770 days for the third. The contract will be accompanied by OPM approval for the necessary priorities.

Grand Coulee Dam is being built for the U. S. Bureau of Reclamation: S. O. Harper, chief engineer, Denver; F. A. Banks, supervising engineer, Grand Coulee Dam. The contract for completing the dam is held by Consolidated Builders, Inc., a combination of contracting firms, for which A. R. Nieman is general superintendent at Grand Coulee.

Fire-Retardant Paints

Of fire-retardant paints that have been developed by the U. S. Forest Products Laboratory for interior use, and which afford protection against small fires where appearance is a secondary consideration, the most successful are those containing borax in addition to various pigments. As described in *Technical Note No. 249* of the Laboratory, these paints stand high in fire-retarding properties, but their formulas are still in the experimental stage and the limits of their performance have not been determined. White-lead paints containing borax appear to be superior to those having other pigments. Although such paint did not qualify for outdoor exposure, it resisted humidity conditions indoors without serious loss of efficiency in preventing the spread of fire. The Laboratory admits that it knows of no satisfactory fire-retardant paint for exterior use.

Ozone Reduces Water Odors and Tastes

Arthur Wardel Consoer
Consoer, Townsend & Quinlan
Chicago, Ill.

James G. Nellis
City Engineer
Whiting, Ind.

***Contents in Brief**—Operating results from an ozone water treatment plant at Whiting Ind., show the process is highly satisfactory in reducing odors and tastes in the city's supply taken from the industrially-polluted lower end of Lake Michigan. Ozone, combined with chemical treatment, has reduced hot threshold odor count from a maximum of 40 to 20 and the average from 15 to 11.*

DESPITE rapid sand filtration and chemical treatment that made the water hygienically safe, the municipal supply of Whiting, Ind., for years carried obnoxious odors and tastes from its industrially-polluted source in the lower end of Lake Michigan. Last fall ozone treatment was added to the filtration, alum, ammoniation and chlorination processes, and the six-months' experience since installation shows a great reduction in tastes and odors at a reasonable cost. Prior to the use of ozone, the hot threshold odor count of tap water was often as high as 40, and averaged 15; with the ozone treatment the maximum count has been 20, and the average is established at 11.

Whiting, an industrial town of 11,000 population, obtains raw water from a Lake Michigan intake only 1,400 ft. from shore in a basin made by two steel bulkheads forming the Calumet and Indiana Harbor, 7 miles long and 2 miles wide, with a 3-mile gap between bulkheads leading to the lake. Into this basin flow the industrial trade wastes of 150 industries, including oil refineries, steel mills, chemical plants, soap works and corn products, as well as raw domestic sewage from a population of 250,000. The domestic sewage problem is being improved as a result of construction of sewage treatment plants in the Calumet District. However, there will continue for years to come the discharge of industrial wastes with a definite effect on tastes and odors at Whiting's intake.

At times, in the past two years, raw water has been noted to have hot threshold odor numbers over 275 and a chlorine demand (15-min. period) as high as 50 lb. per million gallons. The combination of chlorine with the contaminants produces extremely unpalatable tastes and odors. Previous to 1939 the maximum chlorine demand recorded was 35 lb. per m.g. The combination of increased industrial activity and reduction of flow from Lake Michigan through the Sag Channel have accentuated the problem.

Consideration was given to extending the intake farther out in Lake Michigan in order to secure a raw water acceptable from a taste and odor standpoint. It was determined that such an intake line appeared to be prohibitive in cost, and would not likely meet the threshold odor requirements. Consideration was also given to purchasing water from the

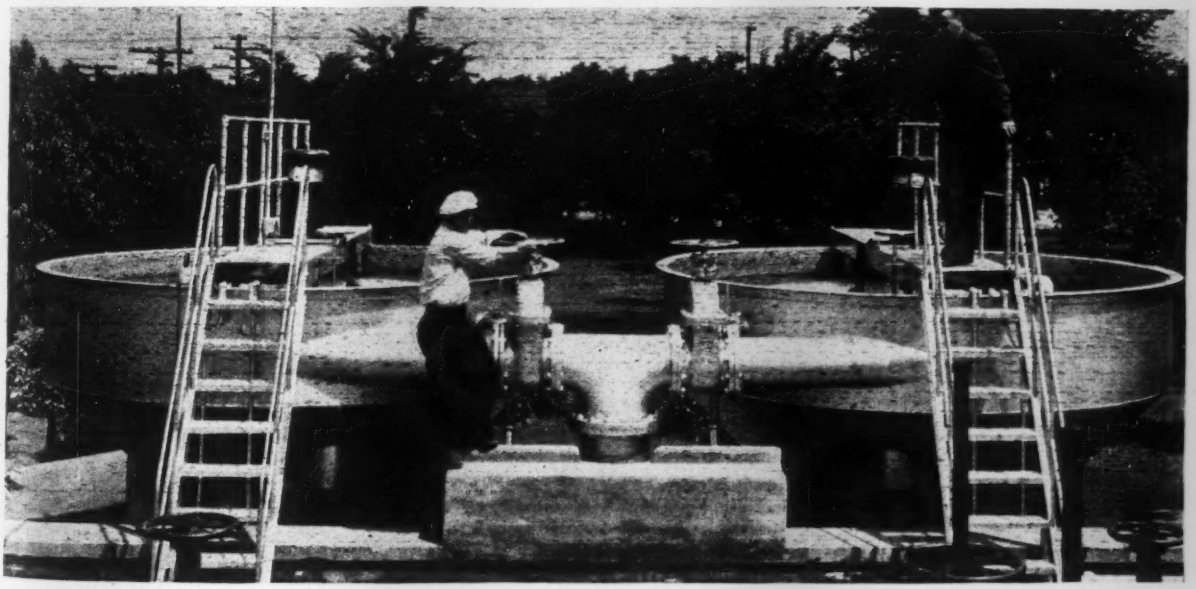


Fig. 1. Ozone diffusers at Whiting are placed in operation by Supt. J. Bartuska and City Engineer James Nellis

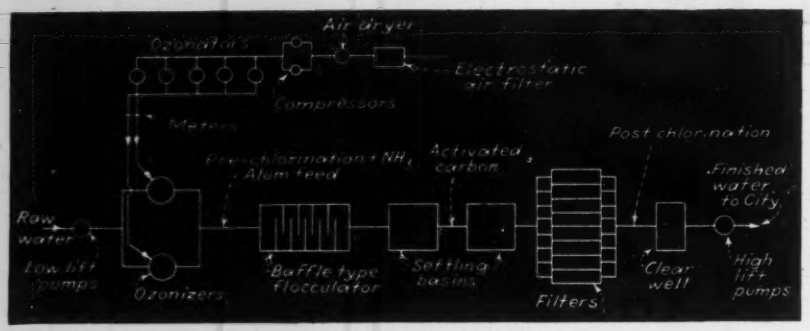


Fig. 2. Flow line diagram of Whiting water treatment plant.

neighboring city of Hammond. Such an arrangement would have involved considerable expenditure for necessary supply and feeder mains, and would have increased the production cost of water for Whiting.

Ozonation adopted

Studies then turned to the practicability of ozonizing the water supply. For about a year during 1938 and 1939 a pilot plant was operated under the direct supervision of James F. Bartuska, superintendent of filtration plant.

It was finally determined that ozonation with the addition of activated carbon when certain combinations of odors occurred, would insure threshold odor counts in the finished water not higher than 6 when that in the raw water was not greater than 30; these results were confirmed by August C. Orthmann for Consoer, Townsend & Quinlan, in a long series of test runs.

A contract was then entered into by the City of Whiting and Ozone Processes, Inc., of Philadelphia, Pa., for adding ozone treatment equipment to the Whiting waterworks plant.

This contract called for a guarantee, backed by a surety bond, covering the following major provisions:

(1) The ozone water treatment plant shall reduce the hot threshold odor number of the raw water to 6 or less when the number of the raw water is 30 or less; (2) reduce the hot threshold odor number of raw water not less than 80 percent when the number of raw water is over 30 and under 75; (3) reduce the hot threshold odor number of raw water to 15 or less when the odor number of the raw water is 75 or more; provided, however, that these provisions shall not apply when the chlorine demand of the raw water is 35 lb. or more per million gal.

The procedure for collection of samples for the determination of hot threshold odor number of ozonated water shall be made as follows: (1) the ozonated water, to which coagulant only has been added, shall be taken from a point near the outlet of the plant mixing basin; (2) samples collected shall be allowed to settle in a suitable container not more than 95 percent covered for a period of time not less than 6 hours, passed through a suitable sand filter at a rate not to exceed 2 gpm. per sq. ft. of sand area, and allowed to stand in a suitable container not more than 95 percent covered for not less than 6 hours; (3) the hot threshold odor number determination shall be made.

The procedure for testing water shall be made in accordance with methods prescribed in the latest edition of *Standard Methods of Water Analysis*, prepared jointly by the American Public Health Association and the American Water Works Association. Entry of any lawful order by the State Board of Health of Indiana during the said three-year period requiring a discontinuance of the operation of the ozone water treatment plant shall not release the contractor from the obligations of the bond. The contractor agrees that during the term of the bond the ozone water treatment plant will not cause excessive corrosion in the water distribution system due to ozone or ozonides.

Description of plant

The existing filtration plant consists of spray-nozzle aeration, an around-the-end baffled mixing chamber, two around-the-end baffled coagulating basins, and six rapid sand filters each with 234 sq. ft. of sand area. At a nominal plant capacity of 4 mgd. the mixing time is 5 min., the coagulation period about 4½ hr. and the rate of filtration 2 gal. per sq. ft. per min. The average water treated is about 60 percent of the nominal capacity of the filtration plant or 2.4 mgd.

The ozonation plant installed has a nominal capacity of 50 lb. per day, with five 10-lb.-per-day ozone generating units. For six months from October, 1940, to the end of March, 1941, the average ozone used has been 11.7 lb. per m.g. with a maximum of 43 lb. The completed plant was placed in operation in July,

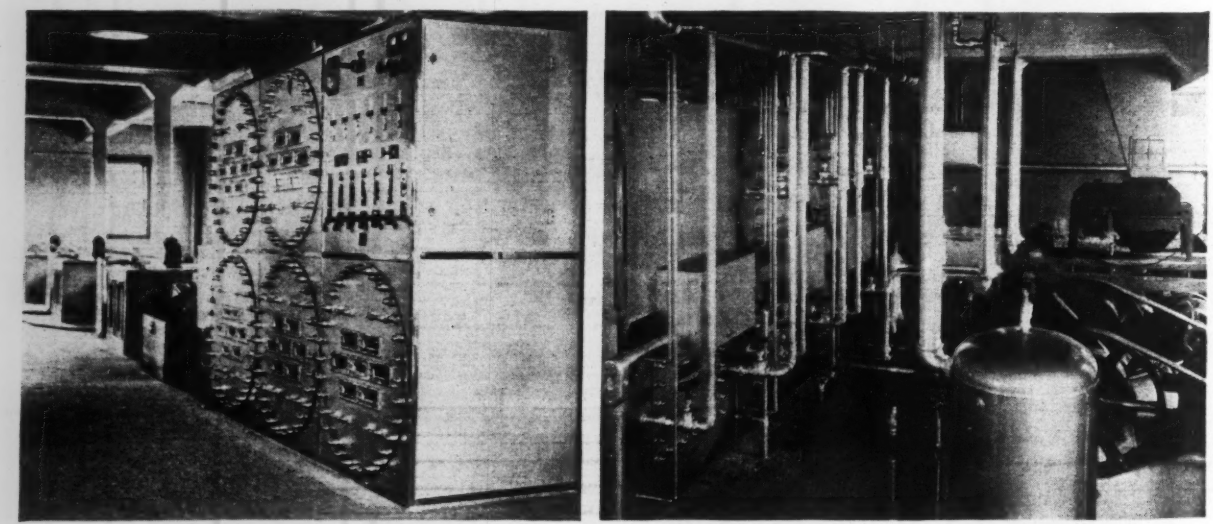


Fig. 3. Ozonators are installed in the filter plant building, as shown in the left view. At right is a rear view of the ozone installation showing the air compressors and precipitators.

1940. Minor adjustments and changes were worked out during the tuning-up period and representative operation was in effect by October, 1940.

Hot threshold determinations before and after ozonation was installed are shown in Table I. Ozone treatment reduces the chlorine demand to an extent that only enough chlorine and ammonia to maintain the desired residual is required for most of the raw water entering the plant. The net effect is that the disagreeable medicinal taste is replaced by a more agreeable sweetish taste and odor characteristic of ozone, with a materially lower threshold odor number. With the ozone treatment it has been observed that the maximum threshold odor number satisfactory to consumers is higher than that which was considered satisfactory with conventional treatment.

The combination of activated carbon with ozonation has been carried on quite extensively during the last few months. However, from the results very little reduction in threshold odor numbers has been accomplished with activated carbon and ozone over the results from ozone alone in the Whiting plant, although pilot plant operations had indicated the value of combining activated carbon treatment with the application of ozone.

TABLE I—HOT THRESHOLD ODOR TESTS

Water Tested	Odor Numbers: Before Ozonation 53 Tests	After Ozonation 84 Tests
Raw water, maximum	220	275
minimum	7	12
average	36	66
Tap water, maximum	40	20
minimum	4	6
average	15	11
Reduction, average raw and tap, percent	58	83

TABLE II—CHEMICAL COSTS BEFORE AND AFTER OZONATION

Chemicals	Six months before ozonation per m. g. Lb.	Cost	Six months after ozonation per m. g. Lb.	Cost
Alum	179	$2.16	147	$1.78
Chlorine	9.2	0.69	6.2	0.46
Ammonia	3.8	0.65	1.9	0.32
Ozone			11.74	2.93
Chemical cost per m. g.		$3.50		$5.49

NOTES:

1. Additional chemical cost with ozonation during 6 months 1940–1941 is $1.99 per million gallons water treated.
2. Chemical costs:

Alum	1.21¢ per lb.	
Chlorine	7.5 ¢	"
Ammonia	17.0 ¢	"
*Ozone	25.0 ¢	(average)

* Ozone costs based on 1628 kwh./lb.

@ $0.0123/kw	$ 0.20
Gas — 49700 B.t.u./lb. @ $0.11/therm	0.05
	$0.25

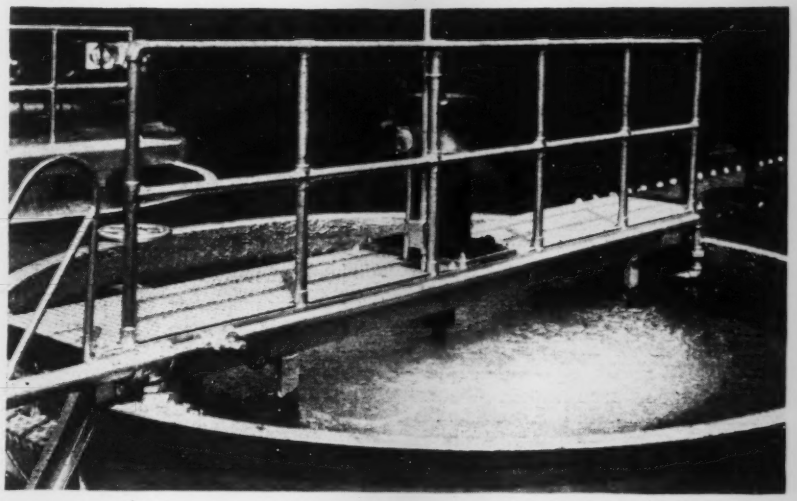


Fig. 4. Ozone diffusion in one of the two parallel 16-ft. ozonizing towers. Ozonized air under pressure is introduced in each tank through a grid of eight porous oxolite tubes, 2⅞ in. inside diameter.

The quantity of ozone required is a function of the character of the raw water and the amount being treated, with sufficient ozone being applied to produce a trace of color with orthotolidine. An indication of 0.15 ppm. on the chlorine comparator scale has been determined to be about 0.10 ppm. of ozone. Overtreatment is not serious, as excess ozone dissipates rapidly. Enough ozone-generating capacity must be provided to produce this residual color for any anticipated combination of the raw water and quantity of chlorine.

The ozonation plant cost about $30,000, with nominal ozone-generating capacity of 50 lb. per day. When the plates are newly cleaned, actual capacity is materially above this but after several months operation capacity is at rating.

An estimate of the total cost of ozonation per million gallons is as follows:

Fixed charges, $30,000 plant cost	
At 6% for interest and amortization,	$1,800
Extra chemical cost, 900 m.g. at $1.99	1,791
Maintenance	409
Total yearly cost	$4,000

$$\frac{\$4,000}{900 \text{ m.g.}} = \$4.44 \text{ per million gal.}$$

Detailed cost data are given in Table II.

In the above cost no additional labor is included. While the superintendent has taken much time to explain the new ozonation plant to interested waterworks men and other visitors, the filtration plant operating force has not been increased.

The results and comments of water consumers to date indicate quite clearly that ozonation has done more than any other treatment in reducing tastes and odors in the water supply.

The work was carried out by the Board of Water Works of Whiting, James McNamara, mayor, James McCarthy, city attorney, and James Nellis, city engineer. James F. Bartuska, filtration plant superintendent, gave valuable assistance during the operation of the pilot plant and during the installation of the ozone plant. Consoer, Townsend & Quinlan, Chicago, are consulting engineers.

Parking Problems

The July issue of *Public Roads*, published by the Public Roads Administration, Washington, D. C., is given over to a discussion of parking. Included is a report on the problem of parking facilities prepared for the department of finance, Highway Research Board, and presented at the last annual meeting of the board by Thomas H. MacDonald, chairman of the department and Commissioner of the Public Roads Administration. Supplementing this paper is one entitled "Some Legal Aspects of Municipally Operated Parking Facilities," prepared by the division of highway laws and contracts of the Public Roads Administration.

Flow in Pipe Networks By Direct Determination

James A. Conklin
Superintendent of Water
Ramsey, N. J.

DETERMINATION OF FLOW in pipe networks is considerably involved mathematically and provides subject matter for many and varied methods of analysis. Frequently the procedure begins with pure assumptions as to quantity flows from which tentative loss-of-head calculations are made. Adjustments are made in these loss-of-head calculations by one means or another and they are then applied to the quantities.

The following method is presented with the idea that this first step—with regard to flow volumes—may be made by direct computation as a preliminary basis for study. The loss-of-head factor is not wholly ignored but when multiplied by the pipe coefficient C is treated as a relatively constant product. To simplify the discussion, the Chezy formula will be used

We have $Q = av = \pi d^2/4\, C\, (rs)^{1/2}$ or $(C\pi/8)\, d^{5/2}\, h^{1/2}/l^{1/2}$
whence the combined constant becomes $(C^1 h^{1/2})$
Finally $Q = (C^1 h^{1/2})\ d^{5/2}/l^{1/2}$ or Q varies directly as $d^{5/2}/l^{1/2}$, which becomes the pipe factor.

Referring to the network figure, which is the same as that employed by Prof. W. E. Howland and F. Farr, Jr., in an article published in *Engineering News-Record*, Feb. 27, 1941, p. 330, a tabulation is made of pipe numbers, lengths *(l)* thereof in 1,000 ft. units, diameters *(d)* in inches, $d^{5/2}$ in ft. and $l^{1/2}$ in ft.

In Col. 6 of the tabulation are listed factors for the apportionment of flow volume in each individual pipe. That is, each pipe has been provided with its own particular quantity or Q factor, depending upon its diameter and length, this factor maintains a definite relationship with the factors for the other pipes, under any given condition of flow.

Application: Given 1.0 mgd. inflow, the quantity in Pipe 1 plus that in Pipe 3 equals the inflow or 1.0 mgd. also. Then if the factor for Pipe 1 be divided by the sum of the factors for Pipes 1 and 3, the quotient will represent the proportion of flow in Pipe 1. Results of the following pro rata distribution of flow among the several pipes of the network are shown in Col. 7 of the tabulation.

From Col. 6—0.707/(0.513 + 0.707 = 0.579
0.579 × 1.0 mgd. = 0.579 mgd. Pipe 1
1.0 mgd. — 0.579 mgd. = 0.421 mgd. Pipe 3

So also the flow in Pipes 4 & 9 equals the flow in Pipe 3.

From Col. 6—0.257/(0.257 + 0.250) = 0.507 proportion in Pipe 4
0.507 × 0.421 = 0.213 mgd. Pipe 4
0.421 — 0.213 = 0.208 mgd. Pipe 9

Take-off—0.100 mgd: then 0.208 — 0.100 = 0.108 mgd. Pipe 10.

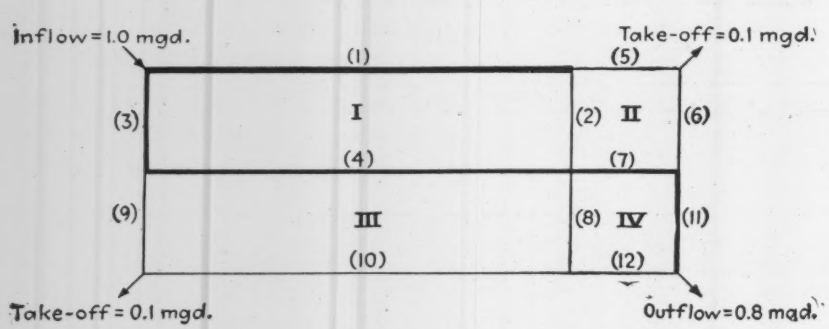
In like manner, the remaining quantities are computed and listed. It may be noted that the maximum deviation of the quantities in Col. 7 with those obtained by Howland and Farr (shown in Col. 9) is less than 9 percent.

The factors of Col. 6 are applicable in apportioning any unit of flow measurement. Loss-of-head values then may be computed and balanced by correlative equations for a review of the quantity flows.

Certain refinements probably may be developed to improve the foregoing procedure, as for instance the use of Hazen & Williams exponents, but the computations given here are brief and should simplify preliminary investigations.

TABULATION OF PRELIMINARY COMPUTATIONS FOR QUANTITY FLOW IN THE NETWORK

1 Pipe No.	2 l 1000 Ft	3 d Inches	4 $d^{5/2}$ Feet	5 $l^{1/2}$ Feet	6 Factor $d^{5/2}/l^{1/2}$	7 Q	8	9 Q Howland & Farr
1	2.0	12	1.0	1.414	0.707	0.579		0.579
2	0.5	6	0.177	0.707	0.250	0.2895		0.292
3	0.5	8	0.363	0.707	0.513	0.421		0.421
4	2.0	8	0.363	1.414	0.257	0.213		0.212
5	0.5	6	0.177	0.707	0.250	0.2895		0.288
6	0.5	6	0.177	0.707	0.250	0.1895		0.188
7	0.5	8	0.363	0.707	0.513	0.338		0.324
8	0.5	6	0.177	0.707	0.250	0.165		0.180
9	0.5	6	0.177	0.707	0.250	0.208		0.208
10	2.0	6	0.177	1.414	0.125	0.108		0.108
11	0.5	8	0.363	0.707	0.513	0.528		0.511
12	0.5	6	0.177	0.707	0.250	0.273		0.289



Pipe network chosen to illustrate the application of direct determination of flow.

Water Pipe Leaks Plugged with "Jelly"

Herman H. Eymer
Consulting Engineer, Saginaw, Mich.

FACED WITH THE PROBLEM of repairing a leaking main under a river, engineers at Saginaw, Mich., effectively plugged the leak with a jellifiable solution pumped into the pipe under pressure. The solution used for this purpose contained sodium silicate and aluminum sulphate, and it was developed for this job by Hans A. Reimers, former chemist of the city water department.

The leaking main that was repaired in this novel fashion was a 24-in. cast-iron river crossing. In a length of 1,400 ft. there were 128 oakum-lead bell-and-spigot joints. It was laid in the fall of 1930, at which time the initial test leakage was 421 gal. per hr. After two years had passed with the pipe still leaking at the rate of 200 gal. per hr., the city refused to accept the line and the contractor was faced with the job of relaying the pipe or stopping the leak. A test with air under pressure indicated numerous leaks as shown by bubbles rising to the river surface along the main.

The writer, who was city engineer at the time, suggested a conference with Mr. Reimers, who proposed that the leak be plugged with a jellifiable solution. Mr. Reimers gave a convincing demonstration of this scheme by filling a 6-in. test pipe with the solution. Increasing pressure was applied and maintained until all previous leakage from the pipe had ceased. The solution was then withdrawn and the pipe subjected to water pressure in excess of operating pressure, and it remained tight.

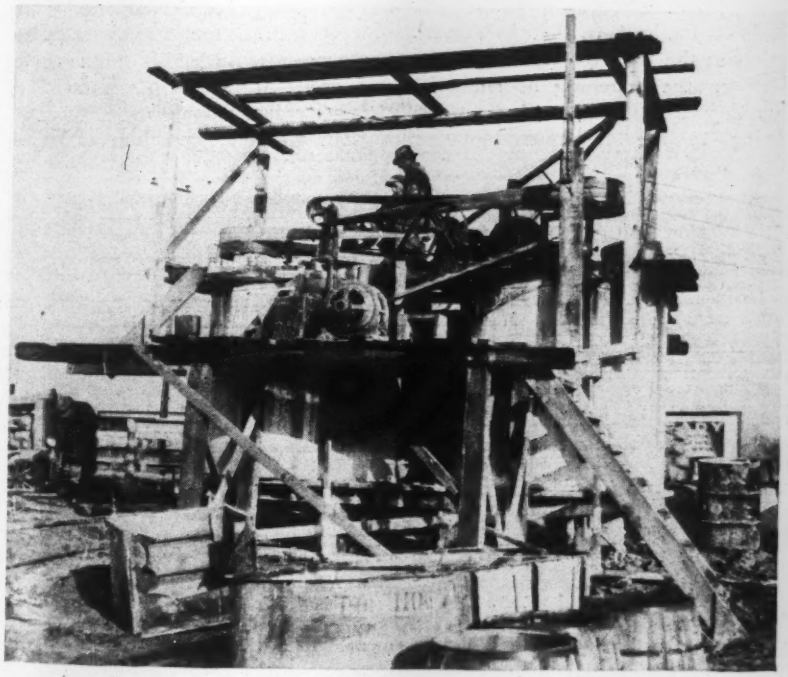
Work was started then on the 24-in. main. First, air was forced into the pipe to displace the water. Meantime, the jellifiable solution—containing sodium silicate and aluminum sulphate, to which some powdered asbestos was added to act as a "filler"—was prepared. The main was then filled with successively prepared batches of solution, and a pressure of 15 lb. was applied to balance the outside hydrostatic pressure. Thereafter the pressure was raised at the rate of 5 lb. per hour until a pressure of 85 lb. was reached.

The gradual pressure increase which was applied to the line enabled the solution to "set" in the leaky places without excessive loss of solution. Five hours after the maximum pressure had been applied, the pressure remained constant throughout the line, showing that the leaks were sealed.

Pressure was maintained overnight and then the jellifiable solution was displaced by a solution of calcium chloride. A test with pressure applied up to 65 lb. showed no apparent leakage. Then the calcium chloride solution was flushed out with a strong flow of water.

Unfortunately, due to a sudden closing of a water valve, which caused a severe water hammer, the leaks were reopened. However, when a 30-day check test was made two weeks later, it showed that the leakage was constant at the low rate of 5½ to 7½ gal. per hr.

Another test made a year later showed that leakage had again fallen to zero. Had not the water hammer been inadvertently applied, it is highly probable that the initial complete plugging of the leak would have persisted. A more detailed description of the method and of the solution used may be found in U. S. Patent 2,188,311, issued to Hans A. Reimers.



Mixing tanks fitted with agitators were used to prepare the jellifiable solution that was forced into the pipeline.

Concrete for Airport Shows Big Increase

A jump from 1,168,000 sq.yd. of concrete pavement used for airport paving in the seven months ending July, 1940, to 18,956,000 for the same period in 1941 is reported by the Portland Cement Association. This is due to the large expansion of military airports and to the expanded program of the Civil Aeronautics Administration. Figures for concrete pavement used in roads for the same period are 19,377,000 sq.yd. for the first seven months in 1941 as compared to 22,501,000 in the same period last year, and 11,008,000 for streets and alleys as against 8,813,000 last year.

These figures do not include the very large yardage of soil-cement runway construction at airports during the same period.

Double Cone Precipitators Soften Water at Minneapolis

J. Arthur Jensen
Superintendent, Department of Water
Minneapolis, Minn.

***Contents in Brief**—Twelve tanks of a special design in which mixing, coagulation and settling operations are combined, feature the new water softening plant for Minneapolis. Recently placed in operation, this 120-mgd. plant is designed to reduce magnesium and calcium hardness as well as assist in color removal by application of lime treatment.*

MINNEAPOLIS placed in operation on June 10 its new lime treatment water softening plant, which incorporates the use of double cone precipitators. This is the largest installation of its kind, there being twelve precipitator units, each with a capacity of 10 mgd. The softening plant, which is located on the Mississippi River at Fridley, Minn., together with pumping and auxiliary facilities, cost $3,973,500 and construction required more than four years' time. The softening facilities are interconnected with two existing rapid filtration plants located at Fridley and Columbia Heights.

Favorable public reaction has been created since the softening plant went into operation. Some initial difficulties were occasioned by complaints that the water was leaving a white coating on developed photographic films, but this trouble has now disappeared. Owners of goldfish also complained that the soft water would not sustain the life of these fish; it is possible that the chemical purity of the water, and a slight chlorine residual may make it unsuitable for raising goldfish, but it also has been indicated that other factors were responsible for the death of the fish. At any rate, industrial plants, laundries, hospitals and housewives are enthusiastic over the improvement, particularly in regard to soap savings.

Big soap savings

According to a survey of soap consumption made by H. W. Hudson, University of Illinois, in the cities of Superior, Bloomington, Champaign, Chicago Heights, it has been demonstrated that per capita soap costs varied in proportion to the hardness of water used in those cities. By plotting a curve showing the relationship between hardness and soap costs it is possible to supply the curve to other waters. Placing Minneapolis water at 170 ppm. on the curve the soap appears at $5.20 per capita per year. By reducing this hardness to 75 ppm. the soap cost becomes $4.25 per capita per year, or a reduction of 95 cents per person. According to studies made on the basis of the city's population at the time the plant was undertaken the softening of water to this degree of hardness indicates a saving to the consumers totaling $451,000 per year for soap alone. It has been estimated that the annual added cost of operation for the softening plant on the basis of 20,000 million gallons consumption will amount to $140,200. This is about one-third of the savings in soap cost to consumers.

Since 1913 the Minneapolis water supply has been coagulated with alum, passed through rapid sand filters, and sterilized with chlorine. At times when conditions require, use has been made of chloramine treatment and activated carbon to alleviate taste and odor conditions. At present the city has two filtration plants. One at Columbia Heights, three miles from the river, delivers water by gravity to the eastern part of the distribution system. The other plant at Fridley delivers water to the westerly portion of the system by direct pumping, and equalizes with the gravity supply in the southern part of the city. Total filter capacity is 158 mgd.

The softening problem at Minne-

Fig. 1. Precipitator room in which twelve units are housed. Each unit consists of a truncated cone with the small end on top, placed inside of another truncated cone whose small end is at the bottom. Diameter of the outer cone at the top is 85 ft. and at the bottom, 58 ft.; the inner cone has a bottom diameter of 60 ft. and the top truncated section is 16 ft. in diameter.

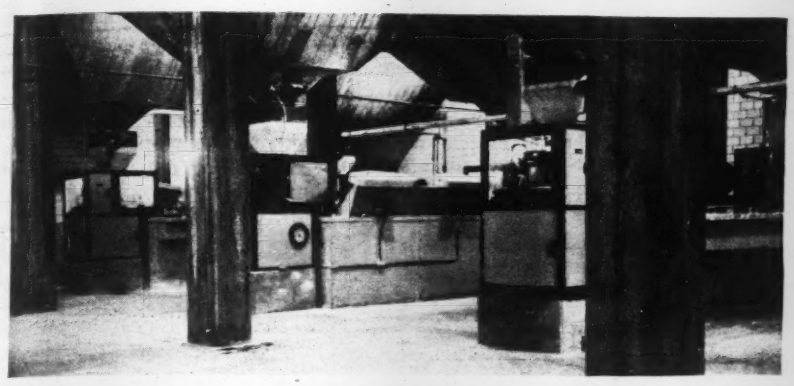


Fig. 2. Chemical feeder room where lime is slacked and added to the raw water together with soda ash, alum and ferrous sulphate.

apolis consists normally of moderating the calcium and magnesium carbonate content of the water supply. The hardness in terms of calcium carbonate for the period from 1930-35 may be taken as typical for a subnormal rainfall period. (For a normal rainfall, the trend would be somewhat lower). Monthly averages and periodic fluctuations show a range from 150 to 206 ppm. Extremes for shorter periods have been noted from 99 ppm. (1922) to 232 ppm. (1925). The average hardness for recent years has been about 175 ppm. The new softening treatment reduces this to 75 ppm.

In the early summer months a high color may appear, which in a water of this hardness requires auxiliary treatment for its reduction. A 23-year record shows that the color range is from an average minimum of 14 ppm. to an average maximum of 101 ppm., with a mean of these averages of 35 ppm. It is proposed to maintain a color of not more than 10 ppm. in the finished water. Experimental work has indicated that normal lime treatment will reduce color to this standard if the original color does not exceed 75 ppm. The record shows further that the color exceeded 100 ppm. seven days per year and that it was in excess of 75 ppm. for an average of 24 days or 6.6 percent of the time. This indicates that color removal by auxiliary means will be required about 24 days each year.

Operation of the softening plant is designed to modify the hardness of the water by lime and auxiliary coagulation, and after stabilization the effluent will be divided when it leaves the carbonation chamber for delivery to the nearby Fridley filters by low service pumping and by high service pumping to the Columbia Heights filters, three miles distant. At these plants the water will pass through the existing coagulation basins to the filters, and, after sterilization, will be delivered to the distribution mains.

When color in excess of 75 to 90 ppm. appears all the raw water will bypass the softening plant and flow directly to the Fridley mixing chambers and the coagulation basins. Alum will be applied to reduce the color to the desired 75 ppm., which brings it within the limited control of the lime softening treatment. After this partial color reduction the water will flow back to the softening plant for normal treatment, following which it will be divided between the two plants as before described, except that the softened water during this short period will be delivered directly to the Fridley filters since the coagulation basins there will be in use for color removal.

The new softening plant consists of twelve double cone precipitators, a low service pumping station, chem-

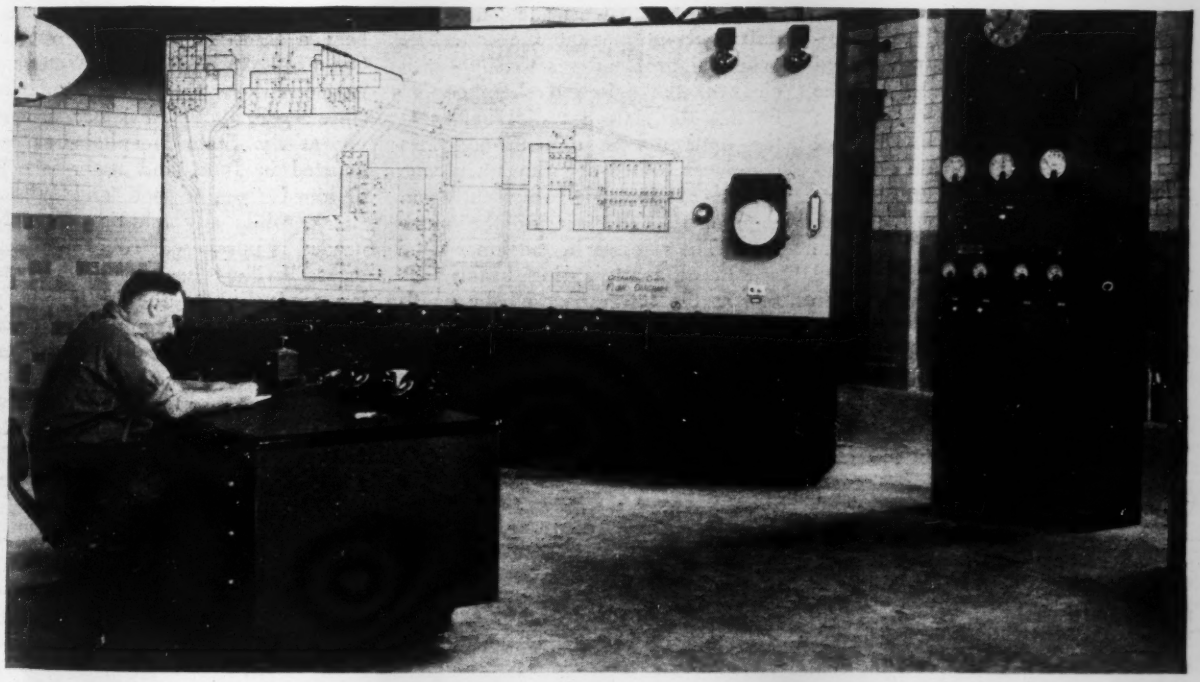


Fig. 3. Dispatcher's station where all operations are centralized for control by electric switching and recording devices.

ical house, a system of influent and effluent conduits, carbonation chambers, sludge concentrators, and disposal beds, and all the necessary mechanical equipment. The basins are enclosed to prevent freezing at the surface in the winter.

Precipitator details

The double cone precipitators, devised by Charles H. Spaulding, general superintendent of the Springfield, Ill., water department, were described in the *Engineering News-Record* of June 3, 1937, p. 804. The precipitator, which is a combination mixing, coagulating and settling tank, consists of an inside truncated cone with the small end at the top where raw water is admitted. Inside the cone is a stirring mechanism. Outside of the cone is another truncated cone with the large end at the top. The annular V-shaped compartment thus formed by the inner and outer cones constitutes a sedimentation compartment. (See *ENR*, July 14, 1938, p. 49).

Each of the precipitators has a nominal capacity of 10 mgd., thus making the total plant capacity equivalent to 120 mgd. The tanks are of reinforced-concrete construction and occupy an area 296 by 379 ft. Because of their design they presented a novel problem in formwork and construction. With a foundation in sand and gravel, the outer basins are all supported on a slab footing of varying thickness and reinforcement. The outer cone is supported on sixteen radial buttress walls and the cone is equipped with four expansion joints at the quarter joints. The shell of the cone is supported on horizontal girders, run straight between buttresses. The increasing length of each girder from the lower edge of the cone to the weir at the top presented intricate formwork construction. In pouring the concrete in the cone, the exterior forms were all in place but the interior forms had to be set progressively as the pouring advanced from the bottom to the top. Each section was secured by specially prepared bolts and nuts, the latter remaining in place. Spacing spools also were held by the same bolts and left in place.

In operation, the low service pumps at the Fridley station will deliver the water to the venturi meters at the chemical house where the lime will be applied together with auxiliary treatment. Four vertical baffles will give uniformity to this application just before the water enters the influent conduit system branching to the twelve precipitators. Above each cone the conduit has a system of openings to spread the water and obviate a jet current. The water moves downward with an ever decreasing velocity. The rotating wheel equalizes eddies and cross-currents and maintains suspension of the sludge particles in the agitation chamber at the bottom. The swirl of the water above the chamber is halted by the sixteen radial baffles rising 8 ft. above the annular opening between the two conic sections.

The rise of water carries the sludge to the plane of equilibrium, which is self-selecting according to conditions. This plane is a distinct division between turbid and clear water. Through the sludge curtain the streamlets of water force their way, impinging against the floc particles thick in their paths. This furnishes the physical conditions for essential contact action. The clear water at the top, rising at the normal rate of two inches per minute, overflows the circular weir at the top and enters the collector conduits, which have their common outlet into the carbonation chambers.

The inner cone does not take any hydraulic loads. It is immersed in water (balanced on the inside and outside) but carries the inlet conduit and agitator at the top. The principal problem was to support it clear of the agitation chamber. To do this the sixteen radial baffles at the bottom were dimensioned into cantilever beams and the inner cone is thus supported coincidently on the radial buttresses of the outer cone. The stresses in the inner cone are borne by two ring beams, the one at the lower part of the cantilever and the one at the upper part being in reverse stresses. These are joined by a beam system to support the shell.

At one side of this chamber is a shallow sump with two outlets, one connecting to the sludge pump and the other to a larger pump to drain the precipitator when required. The adjustable weir at the top of the outer cone forms the inside of a circular conduit leading the water away. The outer space between the precipitators will be quite ample for access and passages. Here have been placed the sludge pumps, drain lines, electric conduits and other auxiliaries.

The collector system leading the clarified water away from the precipitators unites into a long conduit which enters two carbonation chambers, each 30 by 320 ft. These are arranged with gates to operate in parallel and alternately when cleaning is required. At the exit end the water is divided for delivery to the two widely separated filtration plants.

With the exception of the feather-weight-type roof and some minor subcontracts, all of the engineering work and construction of the new Minneapolis water softening plant was handled by the water department staff under the force account system. Edgar W. Johnson was superintendent of construction and assistant waterworks engineer; Harry Stock was in charge of field forces as construction engineer. The writer is in charge of the water department for the city.

Water Shortage in Illinois

Several cases of deficient groundwater supply are noted in a recent bulletin of the Illinois State Department of Public Health, all attributed to the abnormally low rainfall of 25 in. up to July, as against the normal 40 in. At Carbondale, the reservoir became exhausted in June and it was necessary to tap Thompson's Lake, which was expected to suffice until September; a three-mile pipeline to Crab Orchard Lake is proposed. Water has not flowed over the reservoir spillway since April, 1939. At Anna, the supply at the State Hospital was exhausted in June, and water is now obtained from a well and Wilson Creek, while any additional supply needed is purchased from the city.

At Elkville, it has been necessary to lay a pipeline to the Little Muddy River. At West Frankfort, the exhaustion of the supply had been foreseen and an 8-mile pipeline built to Lake Moses, near Benton, Ill. At several other places there is anxiety as to how long the present supply will last; these include Harrisburg, McLeansboro, Galatia and Christopher. At Mount Vernon, the railroads hauled water from the Wabash and Ohio rivers, emptying the tank cars into the waterworks reservoir. They were credited with the amount delivered and were allowed to draw water from the reservoir for their own uses.

Floating a Pipeline Into Place

Harry U. Fuller
Chief Engineer, Portland Water District
Portland, Maine

***Contents in Brief**—Controlled buoyancy secured by means of empty oil drums permitted the installation of a submarine pipeline without the aid of a diver. Timber strongbacks and oil drum floats were designed to limit deflection at flexible joints that connected the 40-ft. lengths of steel pipe.*

WHEN IT BECAME NECESSARY to lay 3,000 ft. of 8-in. steel pipe in Portland Harbor in 40 ft. of water in the winter time an interesting problem in submarine pipeline construction was presented. Since the temperature of the seawater at that time was below 32 deg. the use of a diver would have been slow and expensive. Location of the line where it was exposed to the swells and storms of the open ocean raised the question of how the couplings would stand unusual construction strains to which they might be put.

The plan finally devised to get the pipe from the deck of a lighter into the trench previously dug in the bottom of the harbor worked so well that some details may be worth telling. The scheme involved joining the 40-ft. lengths of steel pipe together above water with Dresser couplings, and insuring that the lengths of pipe would not pull apart by welding two lugs on each end of each piece of pipe through which cadmium-plated bolts were passed on the horizontal axis of the line (Fig. 2). A strongback was then fastened on top of the pipe at each joint to limit the movement of the joint within the safe limits of the coupling deflection, and on the top of the strongback two empty steel oil drums were lashed to provide buoyancy (Fig. 1).

This procedure resulted in the fabrication of a steel tube, one end of which was left above water; some 200 ft. back from this end the tube rested in the trench. This fabrication was strong enough to stand the strains to which it was subjected and allowed additional lengths of pipe to be added as the work progressed.

Since it was necessary to maintain a safe passageway for boats in the channel between the islands connected by the pipeline, the first move was to join together some 200 ft. of pipe and suspend it from rafts supported by empty oil drums at each joint. At each end a Moran joint (a cast-iron ball-and-socket type joint with a permissible deflection of 20 deg.) was connected and beyond each joint 150 ft. of pipe was added.

Strongbacks but no supporting oil drums were placed at each coupling between the Moran joints. Strongbacks as well as supporting oil

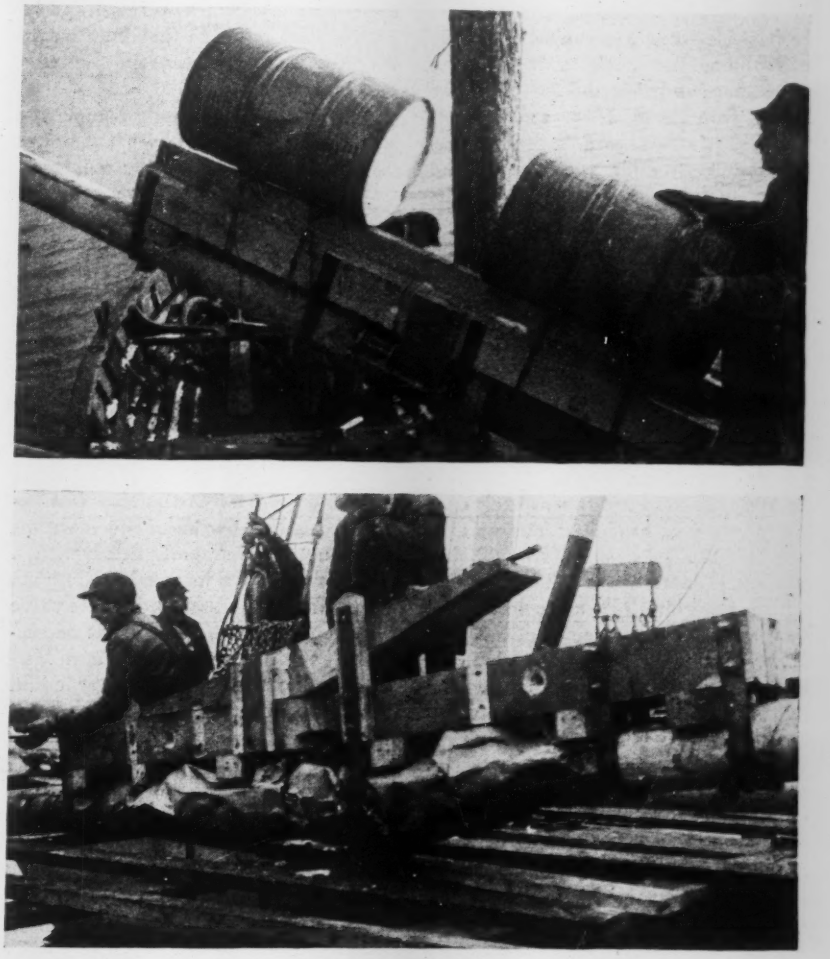


Fig. 1. Methods used in securing joints: (Top) Typical strongback assembly to which is fastened two empty oil drums later used for controlling buoyancy. (Bottom) Special strongback assembly that permits movement of the flexible joint within a limited deflection.

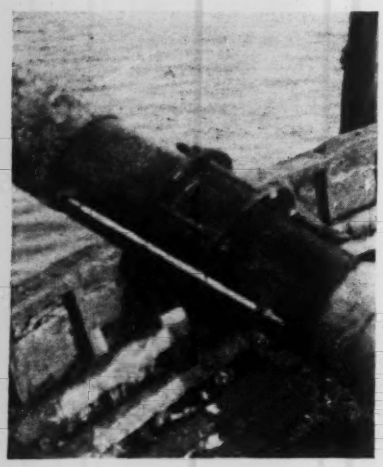
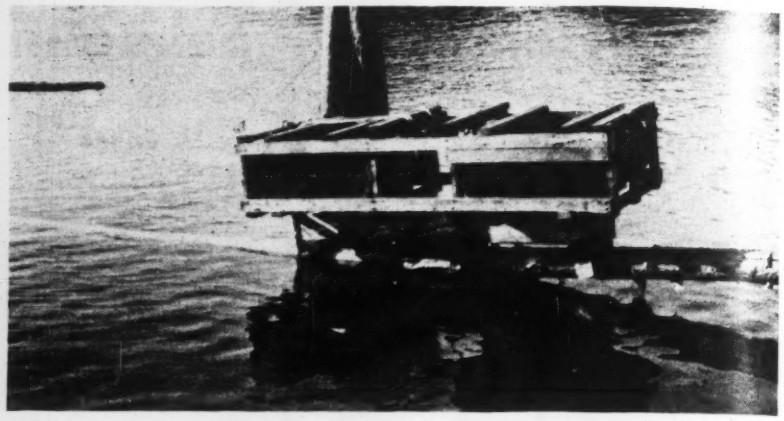


Fig. 2. Coupling with lugs and bolts.

Fig. 3. Floats for the pipeline were made by enclosing four empty oil drums in a wooden crate made with 2 x 4-in. timbers.



drums were placed at each coupling between these joints and the end of the section of pipe. The pipe then was filled with water by submerging the ends and lowering the pipe at each joint from the supporting rafts with the central section the lowest.

In this condition the pipeline was heavy enough to settle to the bottom and when the middle section was lowered both ends were above the water surface. This procedure was accomplished successfully at slack tide by lowering the line slowly and holding the ends of the line at the water surface. From this point the pipe was added a length at a time until it reached the shore.

Strongback construction

The strongbacks were built of five 2-in. planks 8½ ft. long, bolted together and held above the couplings by wooden saddles at each end. They were of sufficient strength to prevent the pipe ends from being strained enough to distort them within the couplings or to break the couplings. Four steel bands $2\frac{1}{2} \times \frac{3}{16}$ in. were passed around the pipe and bolted through the strongbacks. The two bands at each end of the strongback held it firmly against the pipe while the two central bands, one on each side of the coupling, were slack enough to permit a 4-deg. deflection.

The pipe with fittings weighed about 35 lb. to the foot. The strongback afforded some buoyancy but oil drums were required to provide additional buoyancy. When each drum was filled with about 5 gal. of water, the buoyancy was adjusted to a point where the line tended to sink. The line was kept full of water as the lengths of pipe were added and this permitted close control of buoyancy in conjunction with the oil drum floats. After the line was placed in the trench the drums were punctured with a steel point so that they would fill with water and thus be rendered non-buoyant.

When the line approached the shore of the island where the water was more shallow and the length of unsupported line was less, one oil drum on each strongback was found sufficient to give satisfactory results.

Floats for supporting the ends of the pipe at the surface of the water and for lowering the pipe at the channel were constructed with the aid of four oil drums held together by a crate made of 2x4-in. timbers. (Fig. 3.)

Valve controlled filling

While one end of the line was being extended by successive lengths of pipe the other end, fitted with a cap in which was inserted a 2-in. gate valve, was left submerged. This valve was kept under water so that as sections of pipe were added and lowered below the surface, water could enter the line and keep it filled. It was found that water would enter through this valve as fast as was necessary to permit the pipe to settle.

On one occasion when a section of pipe was added to the line, it refused to sink and could not be pushed down. After hunting for some possible obstruction it was found that the valve inadvertently had been closed. After it was opened the line settled in a normal manner.

This method of laying pipe by means of controlled buoyancy was very successful, and the entire job was finished without the use of a diver. The line has been in operation more than 6 months and tests show no leakage.

Successful execution of the work was due largely to the excellent management of Raymond F. Bennett, president of the Bennett Contracting Corp., of Portland, and to Charles R. Moore, resident engineer for the Portland Water District.

Refuse Collection A Municipal Service

More cities in the United States collect refuse under municipal collection systems than by any other method and the number is on the increase, reports the American Public Works Association. This conclusion is reached from a survey of 190 representative municipalities.

Fifty-five percent of the 190 cities, ranging in size from under 25,000 to over 100,000, reported refuse collection as a municipal function. Eighteen percent reported that contracts were let for collection, while 11 percent reported that the service was performed by private refuse collectors and paid directly by property owners. Combinations of the three types of service were reported by the remaining cities.

Compared with a wider survey of 566 cities made about ten years ago, the current report showed a relative increase in the number of municipalities making their own collections, and a decrease in the number of cities with private collection.

From Field and Office

Working problems and time-saving methods for engineers and contractors

Finding Tangent Slopes On Highway Vertical Curves

Calculation of the grade or tangent slope at some particular point on a vertical curve is frequently required in highway work. This discussion and method of solution are based on the property of a parabolic vertical curve that appears to be unfamiliar to many designers. The property is that the change in gradient between the grade at the beginning of the curve and any tangent or grade line is directly proportional to the horizontal distance between the point of tangency in question and the beginning of the curve (P.V.C.). Reference is requested to the curve shown by the accompanying diagram in which the first tangent is produced to point M vertically above point N, the point of vertical tangency of the curve. Elevation on this parabola are given by the equation

$$Y = A + BX + CX^2 \qquad (1)$$

In which:

A = elevation of P.V.C.

B = rate of gradient on the first tangent,

$C = -\frac{MN}{L^2}$ and

X = horizontal distance from the P.V.C.

The slope of the tangent at any point is the first derivative of equation (1) as follows:

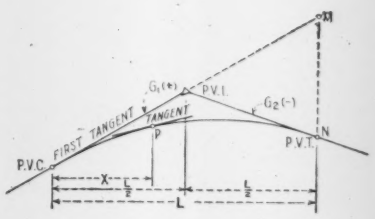
$$\frac{dy}{dx} = B + 2CX \qquad (2)$$

For example the slope of the tangent at point P a distance of X from the P.V.C. equals $B + 2CX$. If the slope is given the formula can be solved for the distance X. At the highest or the lowest point of the curve the tangent is level and the equation becomes,

$$O = B + 2CX \qquad (3)$$

From Eq. 3 the distance from the P.V.C. to the highest or the lowest point can be found.

Considering equation (2) it is evident that since the only variable is the first power of X, the difference or change in gradient between the tangent to the curve at any point and the first tangent or grade line is in direct proportion to the horizontal distance from the beginning of the curve to the point of tangency in question. As the total change in gradient between the two grade lines of the vertical curve is equal to the algebraic difference between the grade G_1 and G_2, by simple proportion the tangent slope at point P may also be expressed as



$$G_1 - \frac{X}{L}(G_1 - G_2) \qquad (4)$$

Where the tangent is level, at the highest or lowest point, the equation is

$$O = G_1 - \frac{X}{L}(G_1 - G_2) \qquad (5)$$

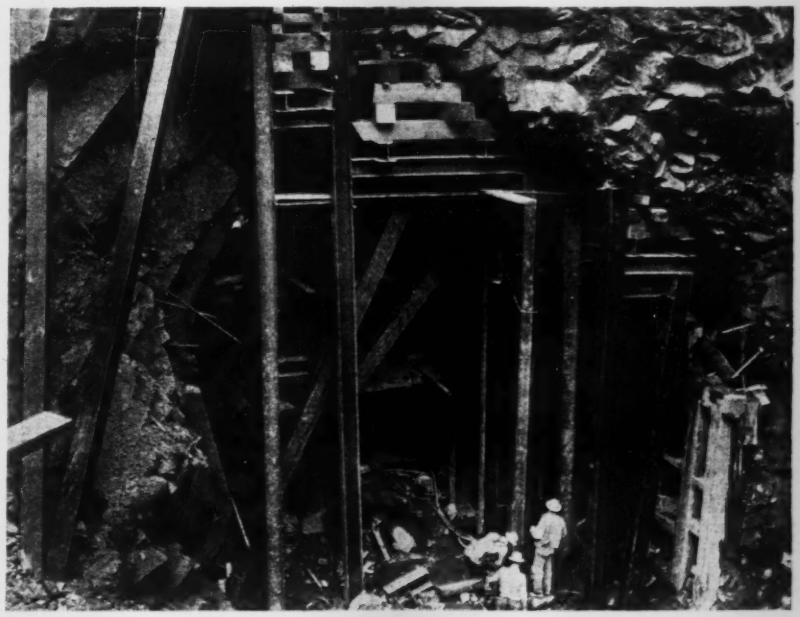
and the distance from the P.V.C. to this point is given, in probably the simplest form, by

$$X = \frac{G_1}{G_1 - G_2} L \qquad (6)$$

It also follows that the tangent gradients of the vertical curve are directly proportional to their distance from the highest or lowest point.—WILLIAM E. COOPER, *State Division of Highways, Babylon, N. Y.*

Home-Made Aluminum Welding Rod Solves Priority Problem

Due to the present priority restriction in effect, to obtain adequate supplies of aluminum welding rod for all work may be difficult. *The Oxy-Acetylene Tips Magazine* reports that fairly satisfactory rod can be made by remelting aluminum scrap, such as old machine parts. The scrap should be melted in an iron pot or crucible.



HEAVY STEEL SHORING OVER TUNNEL PORTAL

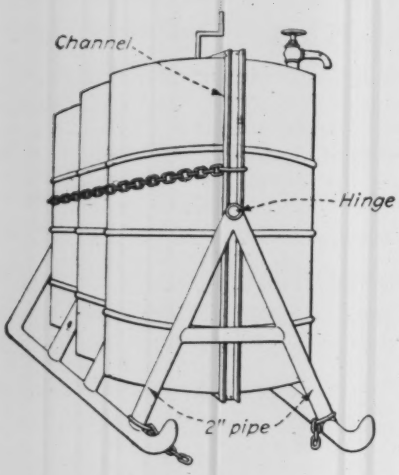
STEEL H-BEAMS, 30 to 40 ft. long, of 12x12-in. 53-lb. section, were used for shoring up rock overhanging the portal of the 23-ft. diversion tunnel at Mud Mountain Dam in Washington. Although expensive, this seemed to be the best means of meeting an emergency created when some 112 cu. yd. of the portal arch came down, crushing the original timber sets. Fortunately the steel beams were available and were hastily put in to prevent what threatened to be a further breaking away of the overhanging rock. Because of the steep walls and the deep canyon, further breaking down of the rock might have created a difficult situation.

using the blowpipe flame as a source of heat. When the metal is molten the dross or oxide film is first poured off. Then the balance of the metal is poured in an angle iron so as to form a cast rod.

Rod made in this manner is less pure and somewhat softer than regular grades of aluminum rod and requires more flux during welding. However, the home-made rod does provide a fair substitute when it is impossible to obtain aluminum rod specially manufactured for welding.

Job-Built Oil Dispenser

A skid-mounted oil dispenser that can be cheaply built for jobs on which trail conditions are bad and equipment cost has to be kept low, is



Sled-mounted oil tanks.

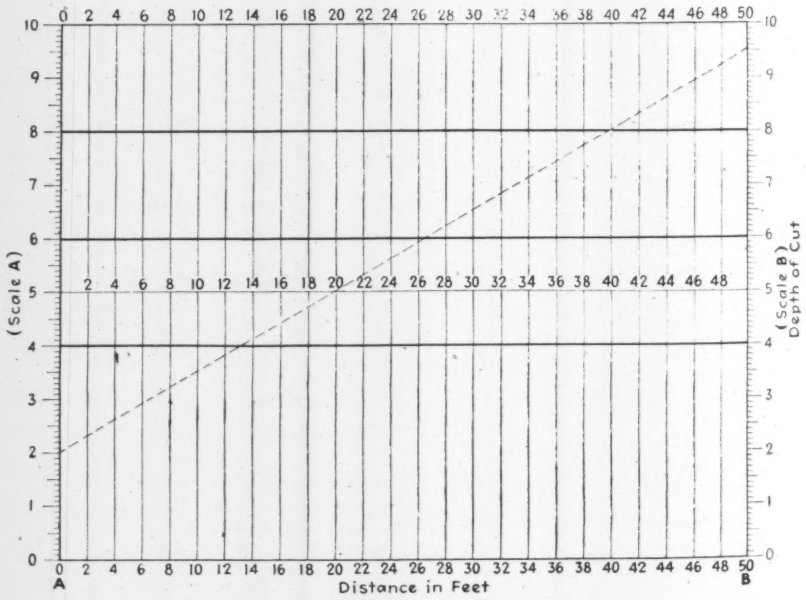
shown by the accompanying sketch. As shown, the fundamental elements are three discarded oil drums. In the first unit built the drums were clamped permanently in place but it was soon learned that a detachable arrangement was preferable so that threaded clamping screws piercing the upper channel iron of the frame enclosure were substituted for welded clamps, and a side chain was attached to facilitate placing and removing the drums. The frame, exclusive of the drum-encircling channel, is scrap 2-in. pipe cut on a power hacksaw to size and the ends trimmed with a torch to make neat fits at the joints. The various parts are assembled by welding the joints and attaching the chain ends. The turned-up ends of the pipe runners are formed in the blacksmith's forge and the brass hinge at the point of contact between pipe frame and channel iron is fashioned in the machine shop. The low center of gravity and the sturdy construction permit this rig to travel wherever a "cat" finds footing.—P. C. ZIEMKE, *Milwaukee, Wis.*

Chart Classifies Ditch Cuts

The contract unit prices on the ditching and backfilling of gathering lines for salt water disposal systems and other pipelines in oil-field work are frequently proportional to the depth of the ditch.

Classification of the cuts necessary to be made by the contractor into 0 to 4 ft., 4 to 6 ft. and 8 to 10 ft. can easily be accomplished with the accompanying chart. Grade stakes are usually set at 25-ft. stations on curves and at 50-ft. stations on straight pipeline and are offset 5 ft. from the pipeline.

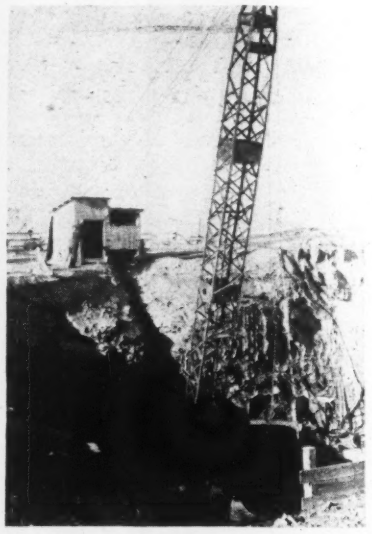
For instance, if the cut at one station is 2 ft. and 50 ft. ahead on the pipeline the cut is 9.52 ft., set one end of a straight-edge on a 2 of Scale *A* of the chart with the other end of the straight-edge at 9.52 on Scale *B* as shown by the dotted line. The chart will immediately show a cut of 0 to 4 ft. for a distance of 13 ft. (Sta. 0+00 to 0+13); a cut of 4 to 6 ft. for a distance of 13 ft. (Sta. 0+13 to 0+26); a cut of 6 to 8 ft. for a distance of 14 ft. (Sta. 0+26 to 0+40) and the remaining distance is 8—10 ft. cut.—EVERT E. ERICSON, *Magnolia Petroleum Co., Dallas, Tex.*



Graph classifies cut depths in pipeline trenching.

Spare Derrick Boom Works in Spare Time on TVA Job

At Watts Bar Dam, under construction by the Tennessee Valley Authority, a spare derrick boom kept on



Simple head for cable shaft at Watts Bar Dam makes use of spare boom.

hand for emergencies was used as a head frame for excavation of a cable shaft to carry electric conduits from the powerhouse to the switchyard.

Power came from a double drum hoist, one cable being used for the load pickup and the other to provide movement of the boom in line with the hoist to swing loads over a truck located on opposite side of shaft.

Exides help excavate 1,000,000 cubic yards of dirt...

"with a minimum amount of battery trouble"...

reports The Herkner Construction Company

Some of the trucks, all equipped with Exide Batteries which "have given us very good service" working 18-24 hours a day, according to The Herkner Construction Co., Cleveland, Ohio.

THE Cloverleaf Project, Cuyahoga County, Ohio, involved construction on a grand scale. A national highway, U. S. 21, had to be relocated. The Cuyahoga River had to be straightened. Bridges had to be moved or widened . . . and new ones built.

On this Cloverleaf Project, "we excavated approximately one million cubic yards of dirt, at a total contract price of about $800,000.00," reports The Herkner Construction Co., Cleveland, Ohio. All of the trucks used on this job depended on Exide Batteries . . . "and went through two and three daily shifts with a minimum amount of battery trouble."

This excellent record with Exides was no surprise to Herkner officials, for they also state that Exide Batteries have given them "very good service" in their heavy construction equipment for a number of years.

Many fleet owners, construction companies, bus lines and others are equally enthusiastic about Exides. Some report mileage records up to 200,000 miles per battery. For Exides are today built to deliver an average of 25% longer life than even Exides ever gave before.

Whatever the size and make of your trucks, gasoline-powered or Diesel, you can cut *your* battery cost per mile the Exide way. See your local Exide Distributor today!

Exide

HEAVY DUTY TRUCK BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

SANTA FE DAM
LOS ANGELES, CALIF.

OWNER: U. S. Engineer Office, Los Angeles, Calif.; Lt. Col. Edwin C. Kelton, district engineer.

PROJECT: Construction of Santa Fe Dam, an earth-fill type structure, on San Gabriel River, west of Irwindale Ave., between Arrow Highway and Foothill Blvd. southwest of Azusa, Los Angeles County, Calif. Consists of five zones, determined by size and quality of material and method of placing. Material for embankment secured from required excavations and borrow pits. Crest length of dam 24,000 ft. Water passed through dam by outlet works in main embankment and through spillway in right wing. Outlet works consist of 16 gate openings. Approach and discharge channels to be built. Service building to be constructed on downstream side of embankment. Levees, 5,000-ft. long and 12-ft. high to be built downstream from spillway.

CONDITIONS: Government to furnish cement, service gates, oil pumps, control valves, switchboard, gasoline-electric standby unit, service crane and trolley hoist. Contractor to furnish all other material and complete work by Dec. 1, 1942. Railway and highway transportation facilities available adjacent to site of work. Wage rates specified are: skilled labor, $1.00 to $1.75 per hr.; semi-skilled, 68¾c. to $1.25; and common, 75 to 87½c. Work in bed of intermittently flowing stream having considerable run-off in rainy season.

BIDS: Four bids were opened June 12, 1941, ranging from the contract low of $8,837,200 to $9,244,569. Engineer's estimate $7,483,310.

LIST OF BIDDERS:

1. Morrison-Knudsen Co., Inc., J. F. Shea Co., Inc., Ford J. Twaits, and Winston Bros. Co., Los Angeles, Calif (contract) — $8,837,200
2. W. E. Callahan Constr. Co., George W. Condon Co., Peter Kiewit Sons' Co., Gunther & Shirley Co., Los Angeles, Calif. — 8,986,060
3. Nicholas F. Jahn, Vincent Bressi, Matt J. Bevanda, John MacLeod, Adolph Tiechert, Jr., Chester M. Elliot, Lloyd S. Stroud, Reginald S. Seabrook, David G. Gordon, William S. Broderick, Los Angeles, Calif. — 9,187,069
4. Guy F. Atkinson Co., San Francisco, Calif. — 9,244,569

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion and care of water	L.S.	$25,000.00	$300,000.00	$195,360.00
2. Remove exist. struct. and obstructions	L.S.	25,000.00	40,000.00	35,000.00
3. Clearing and grubbing	L.S.	25,000.00	25,000.00	45,000.00
4. Stripping	640,000 c.y.	.45	.35	.30
5. Common excavation	1,130,000 c.y.	.35	.35	.33
6. Structure excavation	31,000 c.y.	1.25	.75	1.00
7. Excav.; borrow pit A	1,400,000 c.y.	.45	.43	.50
8. Excav.; borrow pit B	11,000,000 c.y.	.32	.33	.31
9. Backfill	154,000 c.y.	.25	.25	.20
10. Fill in dam embank.; Zone 1	1,000,000 c.y.	.115	.10	.14
11. Fill in dam embank.; Zone 2	640,000 c.y.	.115	.10	.14
12. Fill in dam embank.; Zone 3	7,260,000 c.y.	.07	.07	.05
13. Fill in dam embank.; Zone 4	620,000 c.y.	.23	.07	.20
14. Fill in dam embank.; Zone 5	2,430,000 c.y.	.16	.07	.05
15. Rolling for two trips, Zones 1, 2 and 3	2,400,000 sq.	.01	.01	.005
16. Fill in levees and spillway channel	210,000 c.y.	.06	.07	.10
17. Quarry run rock; levee blanket, toes	92,000 c.y.	3.00	2.60	2.25
18. Derrick stone aprons	52,000 c.y.	3.70	3.00	3.00
19. Grouted rock paving	1,250 sq.	33.00	45.00	28.50
20. Grouted rock ramps, curbs, steps	1,100 c.y.	15.00	20.00	13.00
21. Service road material	50,000 c.y.	.90	.40	.55
22. Plant mixed surfacing	8,400 s.y.	.70	.60	.55
23. Concrete; slabs, footings, cut-offs	70,000 c.y.	4.00	6.00	10.00
24. Concrete; spillway ogee	42,000 c.y.	4.60	4.50	5.10
25. Conc.; intake, control wks., walls, misc. struct	50,000 c.y.	11.00	15.00	20.00
26. Concreting service gate recesses	1,700 c.y.	5.75	15.00	10.00
27. Pressure grouting service gate castings	L.S.	1,000.00	2,000.00	500.00
28. Concreting derrick stone	8,500 c.y.	5.30	5.00	3.50
29. Grouting; quarry run rock and Zone 4 mat'l	10,000 c.y.	6.20	5.00	3.50
30. Furn., bend, place reinforcing bars	11,500,000 lb.	.046	.045	.05
31. ½-in. fibre expan. joint filler	100,000 s.f.	.20	.20	.16
32. ¾-in. fibre expan. joint filler	3,200 s.f.	.25	.25	.22
33. Steel joint seals	7,000 l.f.	2.10	1.40	1.10
34. Copper water stops	3,200 lb.	.65	.60	.70
35. Rubber joint seal, standard	1,600 l.f.	4.85	5.00	4.40
36. Rubber jt. seal, spec. ring seal No. 1	2 ea.	40.00	45.00	50.00
37. Rubber jt. seal, spec. ring seal No. 2	176 ea.	50.00	50.00	50.00
38. Rubber jt. seal, spec. tee No. 3	2 ea.	15.00	20.00	15.00
39. Bitumastic enamel, ⅛-in. thick	80,000 s.f.	.15	.10	.13
40. 4-in. vitrified clay pipe	120 l.f.	.80	.60	.50
41. 4-in. tile drains	325 l.f.	.50	.40	.50
42. 4-in. cast iron soil pipe	325 l.f.	1.60	1.00	1.50
43. Misc. black steel pipe	9,000 lb.	.21	.20	.15
44. Misc. galv. steel pipe	27,300 lb.	.37	.30	.25
45. Water control valves and hose bibbs	50 lb.	2.50	2.00	5.00
46. Gate vent, drainage, float well piping	357,000 lb.	.19	.20	.13
47. Inst. service gates and accessories	1,920,000 lb.	.03	.015	.02
48. Inst. oil pumping units	L.S.	200.00	230.00	250.00
49. Inst. contr. valves for oil pump. units	L.S.	100.00	110.00	500.00
50. Install switchboard	L.S.	260.00	300.00	250.00
51. Inst. gasoline-elec. generator set	L.S.	400.00	300.00	250.00
52. Install service crane	L.S.	700.00	350.00	250.00
53. Install trolley hoist	L.S.	300.00	125.00	100.00
54. Oil pressure system	6,000 lb.	1.25	1.00	1.00
55. Furn. oil and fill oil system	4,100 gal.	.50	.60	.70
56. Conduit for electr. and teleph. wiring	12,000 lb.	.45	1.00	.50
57. Lighting and power system	L.S.	15,000.00	8,500.00	6,500.00
58. Underground power service	L.S.	2,500.00	1,900.00	1,500.00
59. Intercommunication system	L.S.	300.00	300.00	250.00
60. Misc. struct. steel and rails	463,000 lb.	.12	.10	.13
61. Miscellaneous metalwork	17,000 lb.	.30	.35	.30
62. Ventilating fan and piping	L.S.	1,400.00	600.00	1,500.00
63. Misc. steel tubing railings	450 lb.	1.00	.80	1.00
64. Spillway and channel fencing	1,250 l.f.	.60	1.00	.50
65. Float recorder house superstruct.	L.S.	2,500.00	2,500.00	3,300.00
66. Service building superstructure	L.S.	22,000.00	20,000.00	30,000.00
67. Glass brick	12 ea.	2.50	4.00	5.00
68. Autom. drainage gate, 60x60-in.	2 ea.	800.00	800.00	700.00
69. Autom. drainage gate, 30-in	3 ea.	140.00	110.00	200.00
70. 30-in. corr. metal pipe	630 l.f.	8.00	6.00	11.00
71. Gate assembly, 60-in	3 ea.	900.00	800.00	900.00
72. Corrugated metal sheets	5,700 s.f.	.40	.40	.40
73. Gravel drains	120 c.y.	4.00	1.50	5.00

HIGHWAYS, MICHIGAN

OWNER: Michigan State Highway Dept., Escanaba; Ben Sparks, engineer.

PROJECT: Concrete paving 7.944 miles of State Road M-28 west from U. S. Route 2 in Chippewa County, Mich. Pavement width 22-ft.

CONDITIONS: Contractor to furnish all material and complete work by Jan. 1, 1942. Highway transportation facilities available. Local material, such as sand and gravel to be used. Wage rates are: skilled labor, $1.12½ per hr.; semi-skilled, 75c.; and common, 50c.

BIDS: Four bids were opened July 23, 1941, ranging from the low of $187,240 to $195,543.

LOW BIDDERS:

1. Wilmer Pierson, Saginaw, Mich. — $187,240
2. Loselle Constr. Co., Wyandotte, Mich. — 187,699
3. Bacco Constr. Co., Iron Mountain, Mich. — 190,320

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Overhaul	38,807 c.y.sta.	$0.005	$0.005	$0.005
2. Overhaul	4,337 c.y.mi.	.12	.10	.05
3. Fine grading	420.83 sta.	8.00	3.00	3.00
4. Paving reinforcement	103,474.4 s.y.	.23	.22	.22
5. Concrete pavement, 9-7-9-in	103,474.4 s.y.	1.40	1.47	1.50
6. Concrete curve header	99 l.f.	1.00	1.00	1.00
7. RR track encasement, Grade A conc	26 c.y.	12.00	14.00	10.00
8. Aggregate approaches (loose meas.)	1,379 c.y.	1.75	1.25	1.25
9. Clay surface (loose meas.)	8,515 c.y.	.50	.35	.40
10. Bituminous approach mixture	412.6 ton	6.00	5.00	6.00
11. Cable guard rail	2,110 l.f.	.55	.60	.50
12. Cable expansion takeups	4 ea.	8.00	6.00	5.00
13. Braced end panels	4 ea.	15.00	15.00	10.00
14. Guard posts	42 ea.	1.25	1.00	1.00
15. Conc. project markers, 1 plate	2 ea.	15.00	15.00	25.00
16. Obliterate abandoned road	0.3 ac.	50.00	30.00	50.00
17. Final trim and clean up	420.83 sta.	8.00	5.00	3.00
18. Bridges over pavement	2 ea.	100.00	75.00	100.00
19. Concrete end header	22 l.f.	1.00	1.00	1.00

'INCOR' HELPS SPEED SHIP PROGRAM

New Pier and Shipway, completed in 78 days. Contractor: George W. Rogers Construction Corporation, New York.

DEPENDABLE HIGH EARLY STRENGTH SAVES THREE VITAL WEEKS

QUALITY PAYS... INSIST ON LONE STAR AND 'INCOR'

CONTRACT received March 18, 1941 . . . keel blocks laid June 3rd. 78 calendar days to complete this new shipway and pier . . . almost 4 weeks ahead of schedule . . . through good job planning and selecting cement to fit the job. Typical 'Incor' performance in speeding defense construction.

24-hour form removal with 'Incor' means top-speed schedules with 50% to 60% less forms. 'Incor'* makes every day count in speeding completion of factories, bridges and highways, Army and Navy construction. Write for copy of "Cutting Concrete Costs." Lone Star Cement Corporation, Room 2285, 342 Madison Avenue, New York.

*Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • KANSAS CITY • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

September lumber prices show mixed trends, but are generally higher than in August. Pine is $3.00 to $5.00 lower in Baltimore; off $4.00 on 1-in. sizes in Boston; and down $1.00 to $4.00 in New York. Pine is, however, up $1.00 to $3.00 in Birmingham; up $3.00 to $5.00 on 2-in. sizes in Boston; 50c. to $2.00 higher in Chicago; $2.00 to $5.00 higher in Denver; up 50c. to $1.00 in Detroit; up $2.50 to $5.00 in Kansas City; and $2.00 higher on 1-in. sizes in Minneapolis. Douglas fir increased in Baltimore, Boston, Chicago, Kansas City, Minneapolis and Seattle.

Cement, gravel, structural steel shapes, and reinforcing bars are unchanged from a month ago. Vitrified sewer pipe prices rose in Birmingham, Boston, Cleveland, and Kansas City.

Carpenters wage rate is up 12½c. in Baltimore and San Francisco, and 5c. per hour in Cincinnati. Bricklayers and plasterers wages are up 12½c. in Baltimore, and hoisting engineers receive 15c. more per hour. New rates for Birmingham show carpenters at $1.12½, and bricklayers, hoisting engineers and plasterers at $1.50. Common labor on buildings and on heavy construction are up in Baltimore and Birmingham. All *ENR* reported rates for Montreal are above their respective wages a month ago.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE
	Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted			Per ton, carload lots			Per ton, carload lots		Per ton, carload lots, f.o.b. plant		Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags *a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.90	$2.66	$2.61	$1.75	$1.85	$1.95	$1.75	$1.85	$1.55	$1.65	$7.90
Baltimore	2.36	2.11	1.91	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.00
Birmingham	2.50	2.25	2.05	1.75	1.75	1.40/1.50	1.00	1.00	.90	1.15	5.80
Boston	2.75*b*	2.50*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.00*m*
Chicago	2.60	2.35	2.20	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	1.50‡	1.50‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.29	2.04	....	1.50*i*	1.50*i*	1.30*i*	1.90*i*	1.90*i*	1.70*i*	1.70*i*	7.30*i*
Dallas	2.47	2.22	2.02	1.75*p*	2.00*p*	1.25*p*	1.69*p*	1.84*p*	....	....	6.20
Denver	3.08	2.83	....	1.20	1.40	.90	....	....	....	....	7.25
Detroit	2.24	1.99	1.79	1.31	1.41	.91	1.50	1.50	1.65‡	1.65‡	6.50
Kansas City	2.56	2.31	2.16	1.85	2.30	1.00	1.91	1.91	....	....	7.25*n*
Los Angeles	2.25*b*	2.05*b*	....	1.00	1.00	1.00	1.00*f*	1.00*f*	....	....	5.85
Minneapolis	2.90	2.65	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	7.35*f*
Montreal	....	1.95*rs*	1.79*rs*	....	....	1.25‡*t*	.85‡*ct*	1.00‡*ct*	....	....	6.45*ls*
New Orleans	2.41	2.16	1.96	1.50	1.50	1.25	....	....	....	....	7.25
New York	2.55‡	2.30‡	....	1.50*de*	1.50*de*	.90*de*	1.65*de*	1.75*de*	....	....	6.75
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.35‡	....	....	1.10	1.10	8.20*k*
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.55	2.30	....	1.50‡	1.50‡	1.25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	7.75
San Francisco	2.16	1.96	1.66	1.36	1.36	1.36	1.46	1.46	....	....	6.95
Seattle	2.95*o*	2.70*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount 35c. 500 to 2000; 70c. 2000 to 5000; 95c. over 5000. *l* Up to 200cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

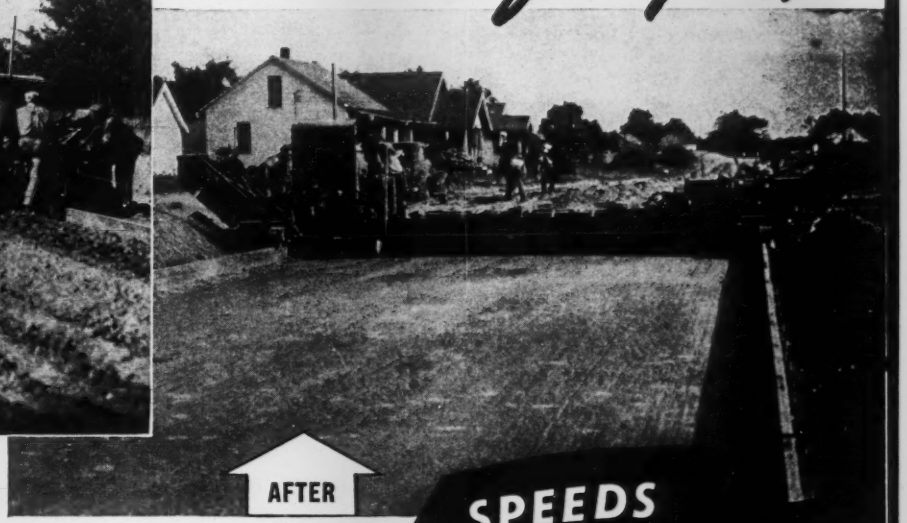
	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn.	$1.80	$1.75
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80	Limedale, Ind.	1.70	1.65	Steelton, Minn.	1.80	1.75
Hannibal, Mo.	1.70	1.65	Norfolk, Va.	1.65	1.60	Universal, Pa.	1.65	1.60
Hudson, N. Y.	1.75	1.70	Northampton, Pa.	1.55	1.50	Waco, Tex (10c. tax in Tex.)	1.75	1.70
Independence, Kans.	1.70	1.65	North Birmingham, Ala.	1.70	1.65	Montreal (8% sales tax incl.)	1.68	1.67

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OILS	ASPHALT EMULSION (Quick-breaking)
	Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Per ton, less than 80 penetration		Per gal., 80-300 penetration		Per ton		Per gal.	Per gal.
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$17.30*e*	$23.83*e*	$0.0695*e*	$0.1018*e*	$0.0734*he*	$0.1257*h*	$0.0634*e*	$0.0734	$0.1257
Baltimore	165.00‡	45.00‡	2.90	14.00	20.00	.06	.09	.065*h*	.115*h*	.....	.....	.....
Birmingham	.....	24.50*j*‡	....	18.20	23.20	.0747	.1047	.0834*h*	.1484*h*	.....	.....	.....
Boston	90.00	50.00	3.50	14.00	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡	.12‡
Chicago	150.00	50.00	1.85*d*	14.50	18.50	13.00*g*	17.00*g*	.06*h*	.10*h*	.05	.095	.13
Cincinnati	112.00	37.50	....	14.00	18.00	.08	.....	16.80	.....	.0625	.....	.085
Cleveland	110.00	39.00	2.25	17.50	22.50	.085	.105	.105*h*	11.00	.0675	.08	.09
Dallas	.....	36.00	....	13.25	20.30	.06	.103	15.00	24.80	.055	.05/.07	.07/.09
Denver	.....	27.50	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	35.00	....	14.10*f*	19.00*f*	.061	.1025	14.10	18.60	.0425	.0645	.098
Kansas City	.....	40.00	....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	....	6.50*b*	15.00	6.50*bg*	15.00*bg*	5.50*b*	.....	.0192	.0525	.1125
Minneapolis	.....	.....	1.90*d*	21.20*m*	27.70	.10*m*	.126	19.00*m*	32.64	.06*m*	.....	.....
Montreal	75.00*k*	.....	3.62*k*	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	....	14.00*a*	19.00*a*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	.....	2.90	15.00	21.00	.06	.09	.065*h*	.115*h*	.....	.....	.....
Philadelphia	120.00	42.50	2.84	15.00	22.00	.06	.12	.07*h*	.13*h*	.06	.07	.13
Pittsburgh	135.00	38.75	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	115.00/125.00	37.00	....	14.00	19.00	14.00*g*	19.00*g*	.06*h*	.095*h*	.04	.09	.125
San Francisco	.....	70.00	....	6.50	15.00	6.50*g*	15.00*g*	7.00	17.50	.025	.0525	.1125
Seattle	.....	60.00*c*	....	15.70	24.10	.....	24.10*g*	10.50/11.50	24.00/25.00	9.75*g*	.0575*i*	.130*ei*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 6 to 8-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* tax included. *m* August prices; tank car price withdrawn in September.

Look what an R-B POWER FINEGRADER *will do for you!*



One Pass and the Grade is Right to Specifications!

LOOK at the illustrations above — they show how a Buckeye R-B Power Finegrader, pulling itself on the forms, cuts into a roughly prepared subgrade and leaves it right on the payline ready for the paving crew! This machine prepares the grade at a cost way below trial and error hand methods and leaves it right to specifications so that you don't put in extra concrete to fill up low spots—it puts material where you want it on the shoulders and it moves fast—always way out ahead of the paver. For concrete, many types of black top roads and airport runways—any width—any kind of soil—and grade, crown or bank—you'll find the Buckeye R-B Power Finegrader is a profit-making machine. It eliminates the bottleneck on otherwise completely mechanized jobs. Plan now to modernize your grade building methods. Write for descriptive catalog on the R-B Finegrader today.

BUCKEYE TRACTION DITCHER CO.

Findlay, Ohio

SPEEDS UP RUSH PAVING JOBS!

1. Produces better grade
2. Reduces loss of yield
3. Reduces labor cost
4. Keeps grade way ahead of paver
5. Requires only one man for operation
6. Reduces rough grading costs
7. Can be used in any soil
8. Built in widths up to 24 ft.
9. Won't damage or misalign forms
10. Equipped with cross-over bridge where trucks ride on grade.

Built by Buckeye

Convertible Shovels

Trenchers

Tractor Equipment

R-B Finegraders

Road Wideners

Spreaders

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ½-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	...
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	...	2.25‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.45*a*	2.50*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per c.l.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

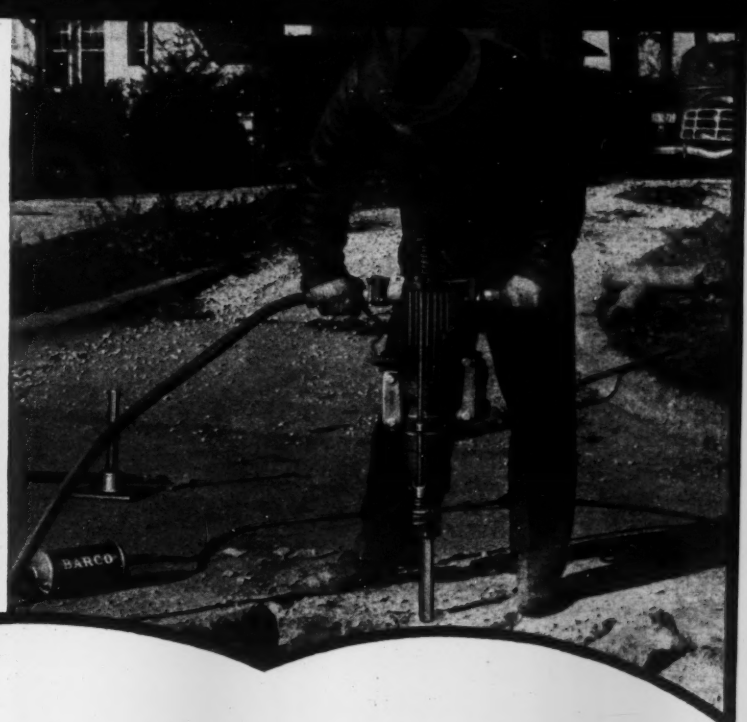
	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS*, Per 100 lb., ¼ in., base price: 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH—Per 100 sq.yd.. carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING—Per 100 s.f.. carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	.02½	.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	29.00	30.00	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.50	1.80	1.34	.1701	....
Boston	3.75	3.11	3.01	$20 C.L.	.10	17.00	19.00	1.76	1.31	.1656	2.77
Chicago	2.10*a*	2.15	2.05	.03	.05	21.00	23.00	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.51*cd*	2.41*cd*	.....	.05	19.00	21.00	1.66	1.25	.1566	....
Cleveland	3.58*g*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	....
Dallas	6.00	3.40	3.40	.....	.....	24.50	26.50	1.93	1.42	.1827	....
Denver	4.35	3.95	3.80	.....	.....	25.50	27.50	1.97	1.45	.1863	....
Detroit	3.65‡	2.25	2.15	.....	.10	22.00	24.00	1.68	1.26	.1584	2.66
Kansas City	4.17	2.51*cd*	2.36*cd*	.0	.05	19.50	23.50	1.78	1.33	.1683	2.86
Los Angeles	3.65*f*	2.25	2.10	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.48*c*	2.48*c*	.0	.10	23.00	25.00	1.80	1.34	.1701	2.73*d*
Montreal	3.90*i*	2.65*i*	2.55*i*	.....	.....	26.00*hi*	33.00*hi*	2.58*i*	3.22*i*	.264*i*	
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1719	2.875
New York	3.75	2.76*c*	2.76*c*	.....	.15	18.50	20.50	1.76	1.32	.1665	2.74
Philadelphia	3.75	2.66	2.56	.....	.....	19.50	21.50	1.71	1.28	.1611	2.72
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.39	2.39	.0	.05	22.50	26.00	1.69	1.27	.1602	2.70
San Francisco	4.70	2.65	2.50	.02½	.10	19.00	25.50	1.93	1.42	.1827	3.25
Seattle	2.75*e*	2.50*e*	.....	.....	.....	25.50	27.50	1.93	1.42	.1827	2.95*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax.

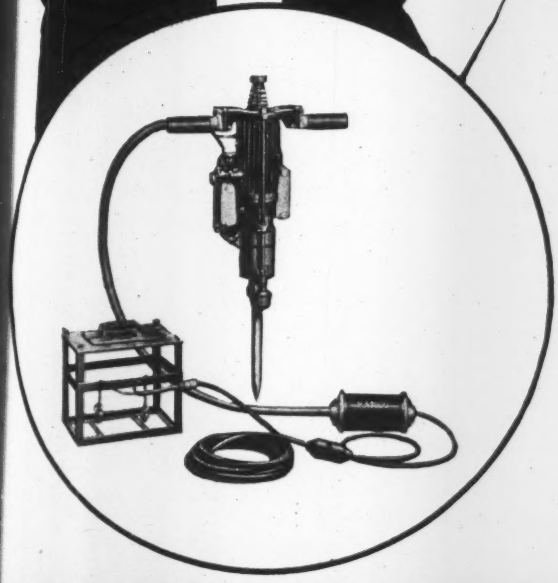
PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE: Per foot, std. 8 in., s.s.	delivered std. 12 in., s.s.	ASTM 24 in.,	C13–35 36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h*: 1 to 3 in., Black %	Galv. %	Butt Weld 3½ to 6 in.; Black %	Lap Weld Galv. %
Atlanta	$49 40	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	62.2	54.2	59.7	51.2
Baltimore	52.80	.45	.70	2.50	6.90	120.00	160.00	.75	2.00	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	4.66	100.00	220.00	.40	1.60	62.2	54.2	59.7	51.2
Boston	55.00	.35	.675	1.98	5.64	202.50‡	315.50‡	.55	2.05	64.1	56.1	61.6	53.1
Chicago	53.80	.28	.54	2.25	6.25	100.00‡	150.00‡	.38	1.48	67.0	59.0	63.5	55.0
Cincinnati	52.70	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	65.9	57.9	63.4	54.9
Cleveland	54.24	.238	.459	1.89	5.33	78.60	125.00	.35	1.50	67.8	59.8	65.3	56.8
Dallas	58.20	.305	.549	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	60.60	.24†	.52†	2.16†	.....	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.24	.245	.4725	1.935	4.60	69.10	109.00	.33	1.50	66.3	58.3	63.8	55.3
Kansas City	55.12	.315	.59	2.20	5.86	140.00	260.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	55.00	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	49.6
Minneapolis	59.00	.25†	.45†	1.80 †	4.60†	.....	.....	.70	1.80	64.2	56.2	60.7	52.2
Montreal	60.00	.55	.90	3.68	5.95*e*	135.00‡	260.00‡	.48*l*	1.92*l*	.....	.....	.....	....
New Orleans	51.38	.26	.48	1.69	.....	150.00	220.00	.37	2.10	62.4	54.4	58.8	50.3
New York	52.20	.455	.8775	2.925	7.65	.....	.....	.50	1.20	64.9	56.8	62.4	53.9*i*
Philadelphia	50.90	.....	.....	.....	.....	.....	.....	.54	1.80	65.3	57.3	62.8	54.3
Pittsburgh	55.60	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5
St. Louis	52.48	.28	.504	2.016	4.50	85.00	170.00	.75*j*	1.80*k*	65.1	57.1	62.0	53.5
San Francisco	55.00	.3275*d*	.5895*d*	2.358	5.895	107.25	178.75	.54	2.50	45.0	31.0	47.0	34.5
Seattle	55.35	.35	63	2.52	6.30	72.00	175.00	.35*f*	1.30*f*	.....	.....	.....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¼ in., 8½c.; ⅜ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½ in.; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76-37. *k* Reinforced; spec. C 75-37. *l* Plus sales tax.



"It's Quickly Become Our BUSIEST TOOL"



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Chicago, Illinois

BARCO *Portable* GASOLINE HAMMER

Dedicated to Pro... THE AMERICAN WAY OF LIFE

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR									LONG LEAF Y. P.		PLYWOOD*
	All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)									Merchantable grade up to 20 ft.		Rail freight increment (See note for base price)
	All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)											
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	5/8"
Atlanta	**$29.00**	**$29.00**	**$26.00**	**$28.00**	**$28.50**	**$30.00**	**$43.00**	.....	.....	$50.00	$55.00	$17.75 $21.60
Baltimore	**38.00**	**39.00**	**39.00**	**37.00**	**37.00**	**39.00**	**55.00**	.....	.....	87.00	92.00	17.35*g* 21.15*g*
	43.00	*43.00*	*44.00*	*44.00*	*44.00*	*46.00*	*55.00*	*$58.00*	*$58.00*	.....	.....	....
Birmingham	**34.50**	**34.50**	**32.00**	**32.00**	**32.00**	**34.00**	**53.00**	**51.00**	**53.00**	.....	.....	16.25 19.85
‡	37.50	37.50	37.00	37.00	37.00	43.00	60.00	.....	.....	67.50	70.00	....
Boston	38.00[2]	38.00[2]	45.00[3]	45.00	70.00[1]	75.00[1]	85.00[1]	.....	.....	85.00	90.00	17.35*g* 21.15*g*
	40.00	*40.00*	*50.00*	*50.00*	*50.00*	*50.00*	*70.00*	*75.00*	*75.00*	.....	.....	....
Chicago	**44.00**	**41.00**	**41.00**	**41.00**	**42.00**	**43.00**	**53.00**	.....	.....	90.00	100.00	13.80 16.80
	41.00	*43.00*	*43.00*	*43.00*	*43.00*	*45.00*	*48.00*	*50.00*	*50.00*	.....	.....	....
Cincinnati	**37.50**	**39.00**	**38.00**	**38.00**	**38.00**	**41.00**	**50.00**	.....	.....	60.00	63.00	16.25 19.85
	.....	.....	.....	.....	.....	.....	*52.00*	*52.00*	*52.00*	.....	.....	....
Cleveland	**42.00**	**42.00**	**42.00**	**42.00**	**43.50**	**47.00**	**55.00**	55.00	55.00	90.00	90.00	16.70 20.40
Dallas *e*	**38.00**	**39.00**	**38.00**	**36.00**	**37.00**	**38.50**	**52.50**	**52.50**	**52.50**	76.00	81.00	13.90 16.95
Denver ‡	53.00[4]	51.00[4]	54.00[4]	54.00[4]	54.00[4]	55.00[4]	57.00[4]	63.00[4]	70.00[4]	.....	.....	9.90 12.05
Detroit	**43.00**	**43.00**	**42.00**	**43.00**	**43.00**	**45.00**	**51.00**	.....	.....	50.00	59.00	16.25 19.85
	.....	.....	.....	.....	.....	*49.00*	*52.00*	*59.00*	*59.00*	.....	.....	....
Kansas City	**47.50**	**50.00**	**45.00**	**45.00**	**45.00**	**50.00**	**55.00**	.....	.....	70.00	75.00	12.25 14.95
	50.00	*50.00*	*45.50*	*47.50*	*47.50*	*50.00*	*50.00*	*60.00*	*60.00*	.....	.....	....
Los Angeles *a*	*40.00*	*40.00*	*39.00*	*39.00*	*36.00*	*36.00*	*43.00*	*48.00*	*43.00*	.....	.....	9.35*gh* 11.35*gh*
Minneapolis ‡*b*	48.00[6]	48.00[6]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.05 14.70
‡	*48.00*	*48.00*	*50.00*	*49.00*	*49.00*	*50.00*	*56.00*	*59.00*	*59.00*	.....	.....	....
Montreal †[7]	*36.00*	*38.00*	*36.00*	*38.00*	*40.00*	46.00	.....	.....	.....	155.00	165.00	....
	53.50	*53.50*	*54.25*	*54.25*	*59.25*	*59.25*	*65.00*	*65.00*	*65.00*	.....	.....	....
New Orleans	**24.00**	**25.00**	**25.00**	**24.00**	**24.00**	**25.00**	**46.00**	.....	.....	62.00	69.00	13.90 16.95
	29.00	*29.00*	*32.00*	*33.00*	*35.00*	*34.00*	*36.00*	.....	.....	.....	.....	....
New York ‡	**47.00**	**48.00**	**46.00**	**48.00**	**49.00**	**50.00**	**59.00**	.....	.....	97.50*f*	105.00*f*	17.35*g* 21.15*g*
‡	.....	.....	*65.00*	*65.00*	*65.00*	*65.00*	*67.50*	*70.00*	*70.00*	.....	.....	....
Philadelphia	**24.00**	**24.50**	**25.50**	**25.50**	**27.50**	**27.50**	**29.00**	.....	.....	50.00	57.50	17.35*g* .1512*g*
	35.00	*36.50*	*39.00*	*38.25*	*29.00*	*39.00*	*44.00*	*32.00*	*32.00*	.....	.....	....
Pittsburgh	**50.80**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	.....	.....	.....	.....	17.00 20.70
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	.....	.....	....
St. Louis ‡*c*	**44.00**	**45.00**	**42.00**	**41.00**	**42.00**	**44.00**	**54.00**	*62.00*	*62.00*	76.00	77.00	13.90 16.95
San Francisco *d*	*32.00*	*31.00*	*32.00*	*33.50*	*33.00*	*33.50*	*33.50*	*32.00*	*32.00*	.....	.....	7.30*g* 8.90*g*
Seattle	*31.00*	*31.00*	*31.00*	*31.00*	*31.00*	*31.00*	*38.00*	*38.00*	*38.00*	.....	.....	0.00 0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [6] Western Pine, No. 3 Common. [7] Spruce. [5] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* At ship's tackle. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax.

Note: Southern pine prices subject to ceiling set by Price Administrator Sept. 5.

NOTE: Special concrete form grade Fir Plywood, 4′ by 8′ panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on 5/8", $86.50; on 3/4", $95.30; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *Many mills out of market due to rush of defense orders. *g* Lower rate by water shipment. *h* 50,000 lb. minimum

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness		EXPLOSIVES Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*	
	A quality	B quality		
Atlanta	75%	75%	$0.15	
Baltimore	79%	80%	.15	
Birmingham	75%	75%	.105	
Boston	78%	79%	.15	
Chicago	79%	79%	.15	
Cincinnati	77%	77%	.15	
Cleveland	77%	77%	.19	
Dallas	78%	78%	.1625	
Denver	77%	77%	.155*e*	
Detroit	79–10%	79–10%	.15	
Kansas City	77–10%	77–10%	.155	
Los Angeles	86%*d*	86%*d*	.1575	
Minneapolis	76%	76%	.155	
Montreal	40–10%‡	50–5%‡	.155†	
New Orleans	70%	75%	.16	
New York	81%	82%	.22*f*	
Philadelphia	82–10%*d*	83–10%*d*	.15	
Pittsburgh	79%	79%	.1225	
St. Louis	77–10%	77–10%	.155	
San Francisco	78%*d*	83%*d*	.155	
Seattle	75%	76%	.1575†	

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.11 –.1175	.135 –.1475	.155 –.1675
Rocky Mtn. States	.11 –.1225	.135 –.1525‡	.155 –.1725‡
Pacific N. W. States	.1075–.12	.1375–.15	.1575–.17
Pacific S. W. States	.1050–.1150	.135 –.145	.155 –.165

‡F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Barge	Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.22	$0.195
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.24
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.28	.255
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.30	.265
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.36	.275
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.42	.415
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.482

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6″x8″x8′ Untr.	6″x8″x8′ Tr.	7″x9″x8′6″ Untr.	7″x9″x8′6″ Tr.
Boston	Oak	$1.30	....	$1.80	....
	Pine	1.60	$2.40*a*	2.40	$3.40*a*
New York	S. L. Sap Pine	1.30/1.40	2.05	1.60	2.55
	Mixed Oak	1.55	2.05	2.00	2.65
Birmingham	White Oak	.85	1.50*a*	1.35	1.70*a*
	Southern Pine	.55*b*	1.10*ab*	.70	1.30*a*
Chicago	Oak	....	1.65*a*	....	2.25*a*
	Southern Pine	....	1.53*a*	....	2.13*a*
Los Angeles	Douglas Fir	.64	1.38*a*	.90	1.80*a*
Philadelphia	Red Oak	1.10	....	....	2.40*a*
St. Louis*	White Oak	1.40	....	1.75	....
	Red Oak	1.40	1.85*a*	1.75	2.35*a*
	Sap Pine or Cypress	1.30	....	1.65	....
San Francisco	Douglas Fir	1.00*bef*	....	....	2.45*caf*
Montreal	Birch or Maple	.65	1.05*a*	.75	1.35*a*

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6″ x 8″ x 8′6″. *c* Empty cell. *d* Zinc. *e* Green. *f* At ships tackle. *August prices; none later quoted.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

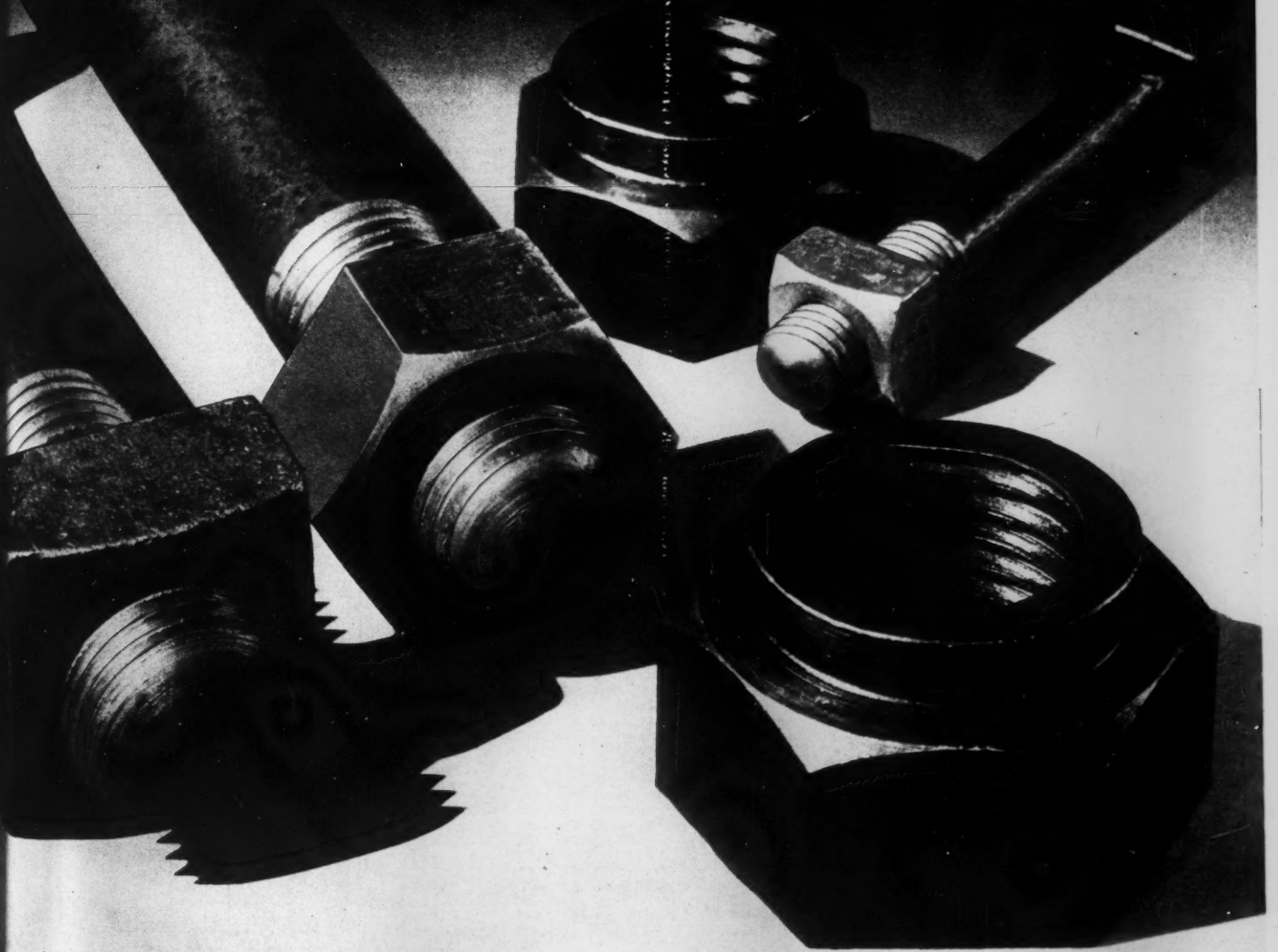
Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.00–2.85
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77-80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, delivered, per ton	20.50–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.10
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00
Sulphate of copper, in bbl., per 100-lb	5.00–5.50

BURLY BOLTS AND A NUT *just as Tough*

Whether you're building a bridge or a tractor, a tank or a tunnel, you'll be using some of these big, black bolts from LAMSON sometime. And if there's vibration to contend with, or sudden shocks to withstand, then you should use these very tough LAMSON Lock Nuts. These lock nuts have undergone such strenuous tests as holding on the shaker screens for coal mining operations—have withstood the pounding abuse of pneumatic hammers—the twists and stresses of chassis assemblies of giant trucks on the highways—and stayed grimly on the job until removed with muscle and wrench. They do not let go voluntarily. You just have to take them off yourself. But even then they can be used again and will hold on just as tightly as before. If unfamiliar to you, ask for samples.

Your Jobber stocks the Lamson line

THE LAMSON & SESSIONS COMPANY, Cleveland, Ohio
Plants at Cleveland and Kent, O.; Chicago and Birmingham



LAMSON & SESSIONS

BOLTS • • NUTS • • COTTERS • • CAP SCREWS • • SPECIALS

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over.			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over.			BRICK Per M. in quantity.		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized or lump
Atlanta	$100.00	$110.00	$195.00	$230.00	$240.00	$240.00	$13.00	$18.00	$26.50	$17.00	$17.00
Baltimore	80.00	85.00	160.00	190.00	240.00	295.00	14.00*k*	17.00*k*	19.00	16.25	2.50*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	2.25*o*
Boston	118.25*a*	126.40*a*	235.50*a*	.....	.....	.....	18.00*i*	21.00*i*	19.00	14.00	2.95*p*
Chicago	68.10	72.60	135.90	185.70	234.90	268.10	11.50	12.50	16.40	14.40	12.20
Cincinnati	62.40	66.50	124.75	149.70	187.90	214.75	16.00	16.00	15.40	12.90	.....
Cleveland	56.50	60.00	112.50	135.00	182.00	209.00	16.00	16.00	15.00*j*	12.00*j*	2.75*jm*
Dallas	52.00	54.00	100.00	135.00	200.00	263.00	11.50*i*	13.50*i*	19.00	15.00	2.95*m*
Denver	84.80	94.40	152.70	178.20	212.00	227.90	13.50	17.00	30.00*j*	19.00*j*	30.00*j*
Detroit	69.00	73.60	138.00	176.00	232.00	265.00*e*	16.50	17.00	16.50	13.90	14.90
Kansas City	64.50	66.50	86.00*c*	125.50	159.75	186.25	15.50	24.00	19.10	12.80	10.70
Los Angeles	73.50†*r*	89.50†*r*	128.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	71.45	76.20	143.95	171.45	173.80	242.10	13.10	15.10*g*	21.00	16.00	19.00
Montreal	72.20*au*	77.50*au*	142.50*au*	76.00*atu*	165.80*au*	248.70*u*	17.50†*u*	24.25†*u*	23.20*u*	17.00*u*	12.00*u*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	13.00	.....	19.00	14.00	17.00
Philadelphia	80.50	85.90	161.10	193.30	238.80	295.60	17.00*s*	20.00*s*	15.70*q*	10.05*q*	12.05*q*
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	62.00	88.00	120.00	180.00	234.00	280.00	17.00	18.00	22.00	16.00	2.30*lm*
San Francisco	84.00	94.50	225.00	.....	.....	.....	14.00	17.00	.75*o*	2.05*o*	16.40
Seattle	100.00	110.00	220.00	.....	.....	.....	17.50*f*	22.00*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* 50c. per M. off for cash. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb net. *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *q* 25-ton cars. *r* 5% discount 10 days. *s* 2% off cash. *t* 5½ x 8 x 12. *u* Plus 8% sales tax.

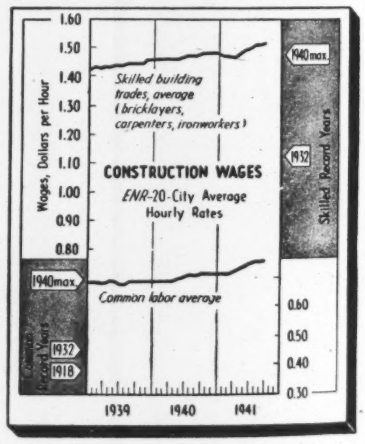
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$9.50	$13.625	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	9.25	13.25	1.95	2.90	2.50	2.60	3.25	3.25	.70	2.50*m*
Birmingham	9.50	13.625	2.35	3.50	1.85	2.15	1.58	1.58	.32	27.00
Boston	9.25	13.25	2.25‡	2.70‡	2.00‡	2.02‡	1.85*h*‡	1.85*h*‡	.50‡	20.00‡
Chicago	9.25	13.25	2.11	2.63	1.72	1.48*hf*	1.50*hf*	1.50*hf*	.26*f*	22.00*f*
Cincinnati	9.25	13.25	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	9.25	13.25	2.50	3.10	1.90	1.84	1.58*h*	1.58*h*	.38	21.00
Dallas	9.25	14.00	1.88	2.11*n*	....	2.50*h*	2.60*h*	2.70*h*	.50	34.00
Denver	9.75	13.75	1.65	2.60	.27*l*	2.45	4.00	3.00	.35	28.00
Detroit	9.25	13.25	1.75	3.00	1.45	2.40	2.50	2.50	.35	26.00
Kansas City	9.25	13.275	2.30*g*	2.55*g*	1.82*g*	1.93	2.09	2.09	.25	25.00
Los Angeles	9.50	13.75	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	9.25	13.375	....	....	....	1.84*i*	1.58*hi*	1.58*hi*	.29	21.00
Montreal	9.25	9.00	2.40	2.97	2.51	2.64	1.85	1.86	.63	1.85*k*
New York	9.25	13.25	2.03	2.55	1.64	2.01	1.72*h*	1.73*h*	.23	24.00
Philadelphia	9.25	13.25	....	....	....	2.27*e*	1.94*he*	1.94*he*	.41*e*	22.00
Pittsburgh	9.25	13.25	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	9.25	13.25	1.90/2.00	2.60/2.80	1.60/2.00	1.65	1.58	1.58	.28	21.00
San Francisco	9.50	13.50	1.80	2.75*n*	1.10/2.00	1.65	2.26	2.26	.28	17.00
Seattle	9.50	13.75	1.80	2.60	....	1.67	1.18*h*	1.75	.35	28.00*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb. *l* Per lb. *m* Per bbl. *n* May price, no later quotation available. *p* Plus 8% sales tax.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.375	$1.00	$1.375	$1.00/1.25	$1.25	$0.40	$0.50
Baltimore	1.625	1.375	1.65	1.65	1.50	.70	.70
Birmingham	1.50	1.125	1.50	1.50	1.50	.50	.45
Boston	1.50	1.25	1.50	1.625	1.625	.85	.85
Chicago	1.70	1.625	1.70	1.70	1.70	1.025	1.025
Cincinnati	1.625	1.50	1.55	1.325/1.525	1.625	.75	.75
Cleveland	1.75	1.50	1.75	1.75	1.75	1.00	1.00
Dallas	1.50	1.00	1.25	1.00	1.50	.50/.625	.50/.625
Denver	1.65*b*	1.43*b*	1.43*b*	1.43*b*	1.50*b*	.718*b*	.718*b*
Detroit	1.60	1.40	1.75	1.625	1.675	.80	.80
Kansas City	1.625	1.375	1.50	1.50	1.575	.85	.50
Los Angeles	1.375	1.10	1.375	1.375	1.50	.655	.655
Minneapolis	1.50	1.25	1.50	1.40	1.50*e*	.90	.90
New Orleans	1.50	1.25	1.50	1.375	1.375	.55	.55
New York	2.00*b*	1.85*b*	2.00	2.00*b*	2.00*e*	1.031	.95
Philadelphia	1.65*b*	1.40	1.65	1.50	1.75	.70	.70
Pittsburgh	1.90	1.50	1.75	1.25	1.75	.80	.70
St. Louis	1.25/1.50	1.50	1.75	1.50/2.00	1.25/1.75	.675/.875	.875
San Francisco	1.75*c*	1.375	1.60	1.50	1.667*c*	.85/.875	.85/.875
Seattle	1.65	1.35	1.55	1.50	1.65	.95	1.00
Montreal	.92	.81	.87	.76	.90	.53	.46



b 7 hr. day. *c* 6 hr. day. *d* 35 hr. wk. *e* 30 hr. wk.

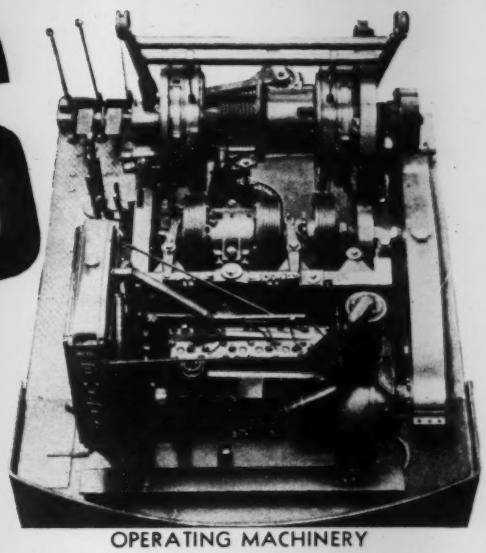
ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.516
ENR Common Average: $0.761

FEATURES

THAT DEFEND YOUR SPECIAL INTERESTS

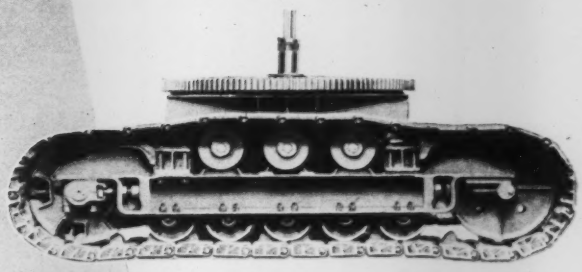
What makes a shovel "tick" is of vital concern to every contractor. It provides him with a basis for determining the merits of digging equipment before he buys. Study the MARION features described here in that light. They back MARION'S DEPENDABLE PERFORMANCE every yard of the way . . . giving sound reasons for modernizing with MARIONS.

THE MARION STEAM SHOVEL COMPANY
MARION, OHIO, U. S. A.



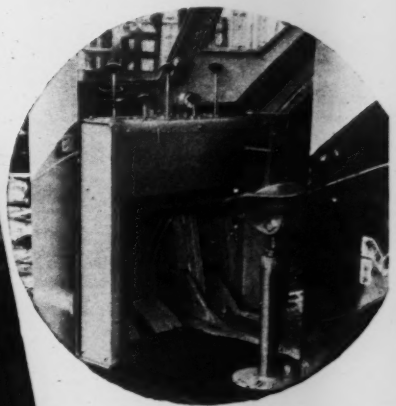
OPERATING MACHINERY

Compact . . . accessible . . . for ease of maintenance and operating simplicity.



LOWER FRAME

Maximum strength with light weight, self-cleaning, non-clogging, non-binding crawlers.



AIR CONTROL

of all operating movements introduces finger-tip control and a new conception of accuracy over all previous methods, and with a minimum of linkage and levers.

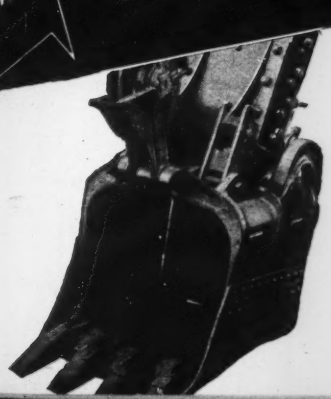
SHOVEL BOOM

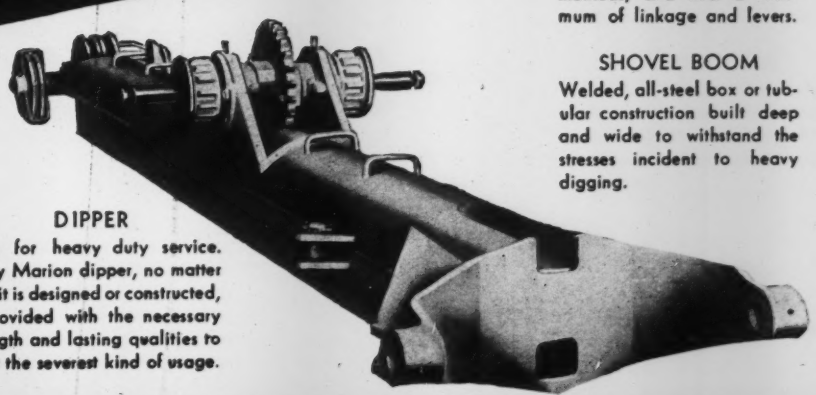
Welded, all-steel box or tubular construction built deep and wide to withstand the stresses incident to heavy digging.

MARION

CRANES • DRAGLINES • SHOVELS • PULL-SHOVELS • CLAMSHELLS • WALKERS
From 3/4 cu. yd. to 35 cu. yds. • Gasoline • Diesel • Electric

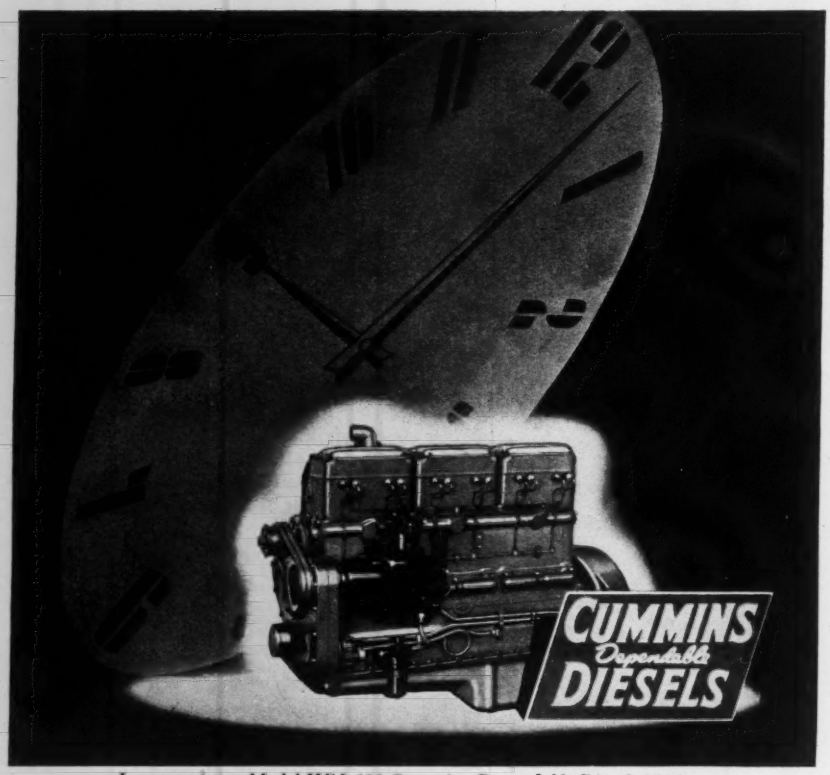
Modernize with





DIPPER

Built for heavy duty service. Every Marion dipper, no matter how it is designed or constructed, is provided with the necessary strength and lasting qualities to meet the severest kind of usage.



ILLUSTRATED: *Model HBI-600 Cummins Dependable Diesel, 150 hp. at 1800 rpm.*

24 HOURS A DAY

The job America has to do—the time allowed to do it—demands power of round-the-clock stamina and proved dependability. Not only are Cummins Dependable Diesels built to stand up under the most gruelling punishment with a minimum of maintenance and service, but they have established new performance records for all types of construction and material handling operations where they're constantly on the job, day and night. That's why the nation's leading contractors have standardized on Cummins Diesel power to keep vital defense projects moving 24 hours a day . . . moving on fast, emergency schedules that assure "doing the job in the time allowed." Cummins Engine Company, Columbus, Indiana.

MEN AND JOBS

Francis O. Carver, Jr., of Roxboro, N. C., has been appointed public relations officer of the North Carolina state highway and public works commission to succeed **R. E. Powell.**

Nebraska's state highway department has contributed the following news of its members: **Wardner G. Scott,** successor to **A. C. Tilley** as state engineer, heads the highway department of roads and irrigation bureau and becomes titular director of the state highway safety patrol and the planning board. Mr. Scott was head of the firm of Scott & Scott for a time. Mr. Tilley is now employed by the National Defense Commission. **Marshall B. Jones,** formerly construction engineer, has been appointed chief highway engineer. **A. W. Bohner,** formerly traffic engineer, has been appointed construction engineer and is succeeded in the traffic post by his former assistant, **J. E. Johnston. A. T. Lobdell,** former chief of the bureau of roads and bridges, is now in the army with the rank of major, serving as an instructor in ROTC at the University of Nebraska. **W. H. Mengel,** formerly secretary of the state planning board, is now acting administration engineer. **Dan S. Jones, Jr.,** formerly deputy state engineer for the state of Colorado at Alamosa, is now assistant chief of the bureau of irrigation.

K. C. McFarland, formerly of the Tacoma, Wash., lighting department, has been appointed as civil and hydraulic engineer in connection with the preparation of plans for an $11,000,000 hydroelectric project at Tacoma.

Jean Vincenz, public works commissioner of Fresno, Calif., has been given a six-month leave of absence to accept a temporary position as civilian engineer on the staff of the Army Quartermaster General at Washington. **W. Frank Rantsma,** deputy public works commissioner, will succeed Mr. Vincenz during the period of leave. His duties will be primarily to serve as technical adviser and director in the Quartermaster Corps in the construction and maintenance of buildings and particularly utilities at Army Posts and Bases.

Uel Stephens is now assistant regional director of Region No. 8 of PWA, serving the states of Louisiana and Texas, with offices in the Electric Building, Fort Worth, Tex. Mr. Stephens was formerly assistant regional director and Regional Engineer of PWA at Fort Worth until the closing of that office;

Monotubes Used on Modern OHIO CLOVERLEAF

Aerial Surveys, Inc.

Another milestone in Ohio's highway safety program was reached recently with the completion of the new Willow Cloverleaf, which is located at the intersection of several important highways just south of Cleveland. Modern methods of construction were used throughout, including steel Monotubes for the installation of more than 800 cast-in-place concrete piles.

The list of prominent projects using Monotubes is mounting daily. The reason—Monotubes offer the simplest and speediest method of producing dependable cast-in-place concrete piles ever devised. These tapered steel casings cut handling time and costs because they are light in weight. Important reductions in driving time are possible because Monotubes require no core or mandrel. There is no cumbersome driving rig to slow you down, either—any mobile crawler equipped with standard leads and hammer does an efficient job. And after Monotubes are installed you can inspect them thoroughly before filling with concrete.

Soil conditions determine the gauge and size for the job. Write for Catalog No. 68A—and remember, Union Metal engineers will be glad to assist you with your foundation plans and problems.

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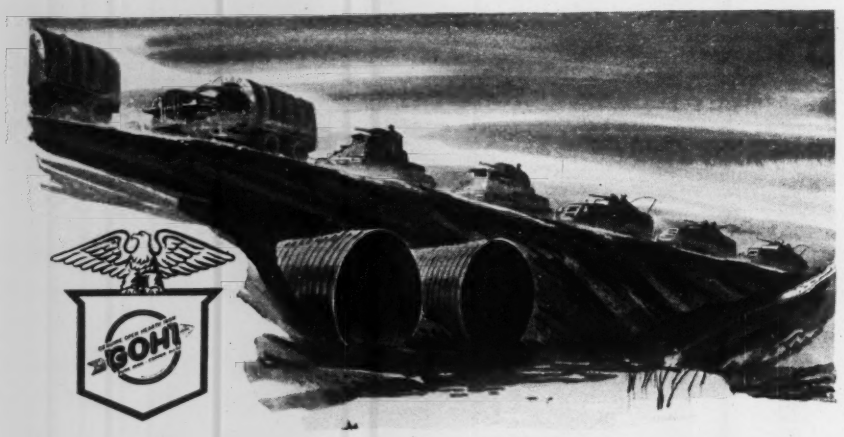
Keeping open the highways of NATIONAL DEFENSE



● To provide for the army that "travels on its stomach," food and material must use the highways, railways and airways. Keeping open these lines of communication is vital to national preparedness, and in all three, GOHI Corrugated Pipe contributes its share, by providing drainage structures to safeguard highways, railway road beds and airports. Buried in the ground, withstanding wear, weather, corrosion, abrasion, the impact of heavy travel, settling and shifting earth, sudden changes in temperature, alternate thawing and freezing, and a score of other destructive conditions, GOHI Corrugated Pipe earns its service stripes for duty ably performed.

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DENVER STEEL & IRON WORKS CO.	Denver, Colo.
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ST. PAUL CORRUGATING CO.	St. Paul, Minn.
THE NEWPORT CULVERT CO.	Newport, Ky.

GOHI CULVERT MANUFACTURERS, INC.,
NEWPORT, KY.

he was then placed in charge of WPA projects throughout the State of Texas for the Texas State Highway Department.

William F. Campbell has been appointed building inspector for the city of Fayetteville, N. C., a position that he held several years ago.

Harold W. Pease, formerly office engineer for the Roza division of the Yakima reclamation project at Yakima, Wash., has been transferred to the Central Valley project in California, with headquarters at Redding. **Harold T. Nelson,** Roza concrete engineer, will take over Mr. Pease's duties. **Edward C. Keeler** will be assistant office engineer and **Curtis Taylor,** who has been with the Roza division a year as technician, will be assistant concrete engineer.

John J. McGauley, supervising and consulting engineer in charge for the State of Rhode Island, has resigned to accept position as mechanical engineer on naval operations, effective Sept. 1, for the duration of the emergency.

Lt. Col. T. D. Simkins, Corps of Engineers, who has been executive assistant to the U. S. District Engineer at Jacksonville, Fla., since 1939, has been relieved of duty there and transferred to Fort Belvoir, Va. as of Aug. 30. **Capt. A. G. Viney** from the Providence, R. I., engineering district, will be executive assistant at Jacksonville.

J. Hawkins has been appointed superintendent of the municipal waterworks at Gillespie, Ill., succeeding **Vernon Koepp,** resigned.

H. Borgar has been appointed superintendent of the waterworks and water treatment plant at Freeburg, Ill. in place of **B. Reiniger,** resigned.

Harry H. Staley, consulting engineer, formerly with the Kansas State Highway department and the city engineering department of Topeka, has been appointed engineer for the North Topeka drainage board.

P. B. Patterson, formerly assistant project engineer, has been appointed plant engineer at the Radford Ordnance Works, Radford, Va., having charge of all plant maintenance, powerhouse and water purification plants. All work previously handled by Mr. Patterson has been turned over to **W. H. Platt.**

R. W. Shepherd has been promoted from manager of District No. 1, Alabama WPA, with headquarters at Decatur, to be assistant state director with offices

BIG ROOMY SKIP

Special baffle plates at skip sides protect paver from cement, sand and gravel.

Wide skip permits easy and quick spotting of loaded batch trucks.

Large skip area provides sufficient space, without crowding, for maximum batch.

Skip of Koehring 34-E Unibatch is large enough to hold the maximum size batch without crowding . . . wide enough for easy entrance of batch truck tires. Special plates at the sides prevent cement, gravel or sand from falling on paver . . . protects operator from excessive dust. Heavy plate construction with replaceable liners and tire tread plates assure a rigid unit for batch truck loading. An unobstructed flow-line, large skip throat, permits almost complete flow of the aggregate from the skip to the drum, before the skip is in the maximum elevated position.

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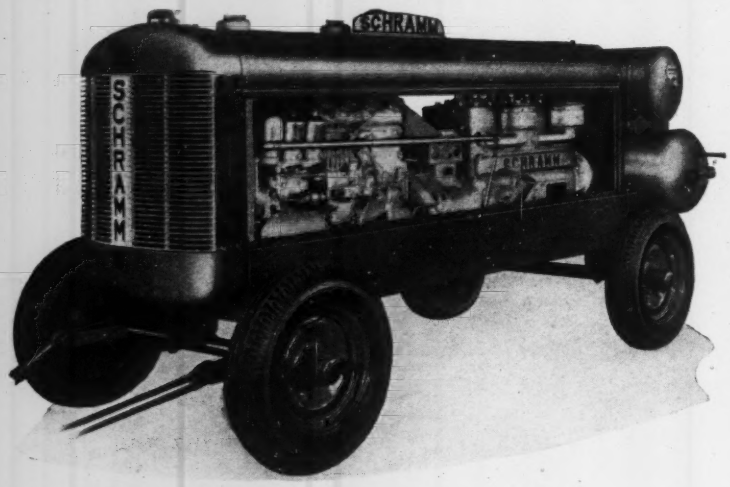

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Gasoline or Diesel Engine Drive
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SCHRAMM, INC.

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DEALERS IN PRINCIPAL CITIES

at Montgomery. Mr. Shepherd is succeeded by **J. B. Carrington,** former WPA area engineer for Madison as acting manager of District No. 1.

Henry B. Steeg, coordinator of the Indiana State Defense Council, has tendered his resignation to return to private practice as the head of Henry B. Steeg & Associates, Indianapolis.

Michael W. Bannon, a member of the New Britain, Conn., Water Commission, has been appointed deputy commissioner of the Connecticut Public Works Department to succeed **George L. Burke,** who is commissioner of public works.

E. A. Crump has been appointed assistant division engineer for the 4th Division, North Carolina State Highway and Public Works Department, and will be located at Wilson, N. C.

E. A. Sunstrom of Chicago, formerly connected with public utility department of Arthur Anderson & Co., certified accountants, has been appointed comptroller of TVA.

Ray Warren has resigned as city engineer, superintendent of streets and building inspector of Greensboro, N. C., to accept an appointment as executive director of the Greensboro Public Housing Authority.

Elmer Krieger, senior planner for the city of Milwaukee, will fill temporarily the vacancy created by the resignation of **C. B. Bennett,** city planning engineer.

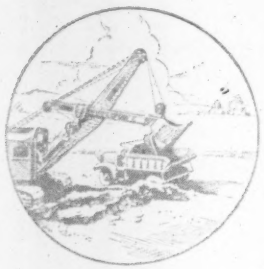
Frank Upman, Virginia engineer and former acting state WPA administrator, has been appointed deputy state highway commissioner for Connecticut. A graduate of the University of Virginia, Mr. Upman has had wide experience as a consultant.

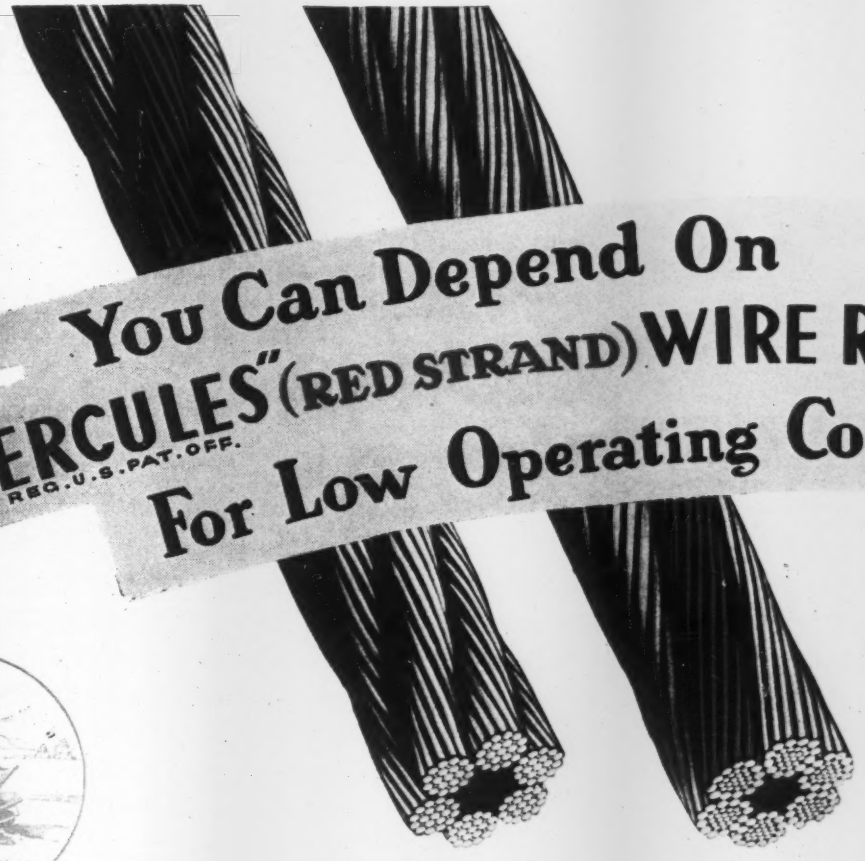
Gilbert E. Olson has been made southern sales engineer for H. K. Ferguson Co., and is in charge of their new branch office at Houston, Tex. Mr. Olson was chief mechanical engineer at Camp Hulen, Tex., where his record won him a promotion as project coordinator for Camp Wolters at Mineral Wells, Tex.

Augustus Griffin, who has been with the company since 1918, has been appointed assistant manager of the department of natural resources of the Canadian Pacific Ry., with headquarters at Calgary, Alta. Previously Mr. Griffin was chief engineer of this department, and also served as superintendent of operation and maintenance of the company's western section irrigation project. In this latter capacity, he will be succeeded by **E. N. Ridley,** with headquarters at Strathmore, Alta.

You Can Depend On "HERCULES" (RED STRAND) WIRE ROPE For Low Operating Cost

REG. U. S. PAT. OFF.





Correct construction is also an important factor in wire rope economy. In "HERCULES" there is a right rope for every purpose, as it is furnished in both Round Strand and Flattened Strand constructions—all of which are available in either the Standard or Preformed type.

Production requirements must be met. Why not let "HERCULES" (Red-Strand) Wire Rope help you meet this demand and still maintain a reasonable margin of profit?

You can rely on "HERCULES" to keep costs down, because it is made on the principle that—*"With wire rope it pays to use the best"* . . . In its entire process of manufacture, exacting tests and rigid inspections leave nothing to chance. All this, plus manufacturing efficiency, means longer rope life at no higher cost.

You will quickly discover that "HERCULES" (Red-Strand) Wire Rope is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production. Specify it on your next requisition.

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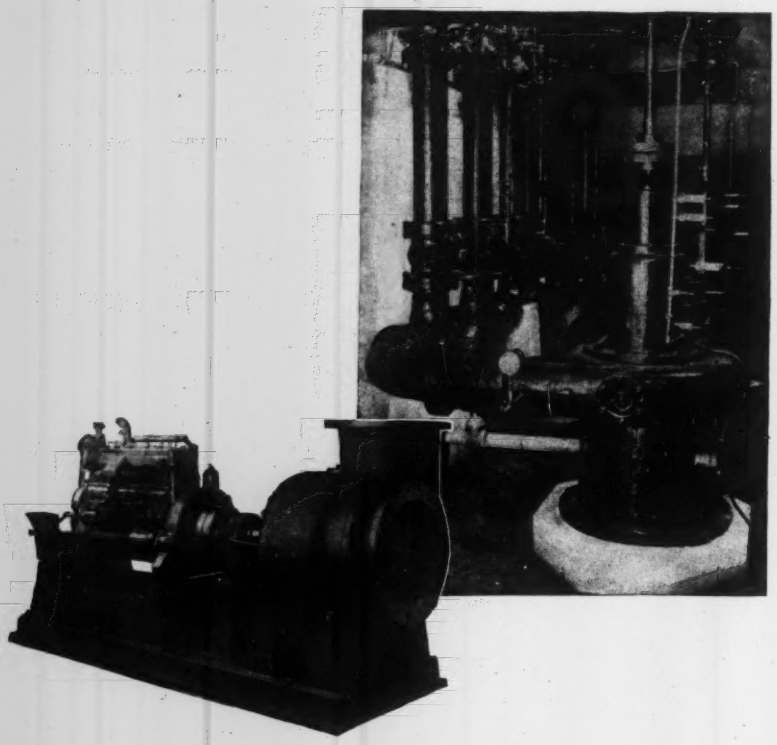

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Morris Centrifugal Pumps have made notable records in municipal pumping services . . . notable for low power consumption, trouble-free operation, low maintenance costs, and long life.

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CENTRIFUGAL PUMPS

for all municipal and industrial services

Robert W. Clark, business manager of the Connecticut highway department since April, 1940, has resigned. He was graduated as a civil engineer from Cornell in 1909 and after many years in engineering practice and contracting became assistant to the director of the construction division of the Farm Tenancy Administration, Washington. In 1939 he was appointed budget engineer of the Connecticut department.

J. E. Shelby, Little Rock, Ark., has been installed as district engineer at Batesville, Ark., succeeding the late James B. Stokes.

David Deal has been named WPA project supervisor for Cleveland and Dallas counties, Ark., succeeding **Doyle Crowell,** who has resigned to accept a position with the U. S. Engineers. Mr. Crowell will make his headquarters at Booneville, Ark.

Harold Lyon, a graduate of the N. C. State College school of engineering, has just been named city engineer and operator of the water plant at Oxford, N. C. A native of Oxford, Mr. Lyon will take over part of the duties formerly handled by **W. B. King,** who resigned recently to accept a position in Wilmington, N. C.

Walter E. Kroening, acting manager at Greendale, government housing project near Milwaukee, Wis., since the transfer of **Sherwood Reeder** to Washington last December, has been given the permanent appointment by the Farm Security Administration. He has been with Greendale since it was started; his first position was as sanitary engineer.

M. V. MacDonald, civil engineer, is now construction engineer at the Beloeil Works of the Canadian Industries Ltd., Beloeil, Que. He is a graduate in civil engineering from the University of Saskatchewan and holds an M.S. degree from McGill University.

Roland Lemieux is now assistant to the district engineer of the Department of Roads at Quebec. He is a graduate in civil engineering from the Ecole Polytechnique of Montreal.

G. O. Beaulieu is now a structural designer with the Dominion Bridge Co. at Lachine, Que. He is a graduate in civil engineering from the Ecole Polytechnique of Montreal.

P. E. L'Heureux is now assistant division engineer with the Quebec Department of Roads located at Sherbrooke, Que. He is a civil engineering graduate from the Ecole Polytechnique.

William Darby has been retained by the city of West Allis, Wis., close to Milwaukee, to draft a defense public

"BREAK" IS A LOT SMARTER THAN "BROKE"

ALTER EGO: Literally, "one's other self"— the still, small voice that questions, inspires and corrects our conscious action.

It takes nerve to BREAK with precedent and change over to making these things by arc welding.

ALTER EGO: It takes a lot more than nerve to keep on making them the way we do—when we KNOW they cost more—when we KNOW welding will improve both the product and the output. That's more than nerve. It's CRUST.

But our customers are familiar with our present design.

ALTER EGO: That's no asset. They're more familiar with CHANGE. If they read or look, they're familiar with the *change* to welded ships, the *change* to welded trucks, welded steel machines —tanks—every metal product whose production had to be stepped up—fast.

Gee! People are getting more and more welding-minded. Isn't there danger of our customers starting to switch to the welded designs of our competitors?

ALTER EGO: They're looking after *their* interests, aren't they? Why not look after *ours?* Let's BREAK with habit before it's a case of being BROKE.

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LINCOLN SUGGESTS: The easiest way to change over to welded design is to start with the simple elements and small structures. Then gradually apply welding to the larger, more involved designs. This will start giving you the 10% to 20% savings in steel tonnage and faster construction and will prepare you for the days ahead when welding will be a *must* in the construction business. Our Structural Studies will be sent you on request.

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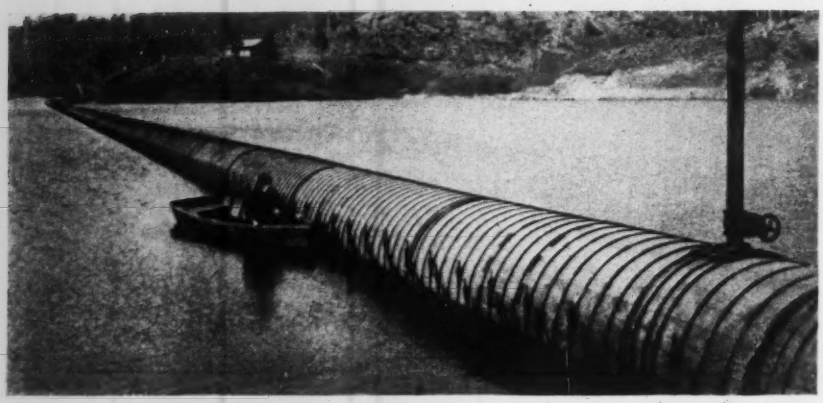

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Service Records

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The odds are all against untreated wood when you install it in sanitary works and water supply plants; conditions are usually right for rapid decay and failure.

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Wherever wood construction must encounter the severe conditions found in these and similar industries, Wolmanized Lumber solves the problem of endurance. And it offers no handling and erection problem; it is easy to handle, clean, odorless and paintable. For further data, write American Lumber & Treating Company, 1649 McCormick Building, Chicago, Illinois.

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WOLMANIZED LUMBER

works program aggregating in cost about $1,347,000. This work is to consider the construction of two and three-deck parking stations.

V. B. Pierce, superintendent of the water and light department at Weldon, N. C., for the past three years, has just been named city engineer and chemist at Laurinburg, N. C., succeeding **D. Y. Brannock,** who has accepted a position at Rocky Mount, N. C.

Don Stordahl, chief draftsman for the South Dakota Highway Planning Survey, has received a civil service appointment with the U. S. Army Engineers. He was assigned to duty on the Island of Antigua, B.W.I., with headquarters at San Juan, Puerto Rico.

Homer D. Looney, who spent six years as senior foreman in the Soil Conservation Service, on Aug. 1 joined Burns & McDonnell Engineering Co., Kansas City, Mo. Mr. Looney is engaged in preparing plans and estimates on the new army cantonment at Neosho, Mo., and is stationed at Neosho. **Capt. Harry C. Walker** is constructing quartermaster on the work.

Joe Plut, of Sisseton, S. D. has been appointed surveyor in charge of county road work in Roberts County, S. D. He succeeds **T. W. Cahill,** who resigned to accept an appointment as army highway engineer at Seattle.

W. C. Lefevbre, formerly PWA office engineer in San Francisco, has been recalled to PWA service as office engineer in Ft. Worth, Tex.

James Girand, formerly city engineer of Phoenix, Ariz., has accepted a position as office engineer for Leeds, Hill, Barnard & Jewett, consulting engineers on cantonment construction at Santa Maria, Calif.

William E. Willey, for a number of years office engineer with the Arizona state highway department, received his commission as lieutenant in the Army Air Corps and is now stationed at Tucson, Ariz.

Fred Tebbetts is in charge of the federal engineering activities in connection with the acquisition and enlargement by the U. S. Government of the municipal airport at Presque Isle, Me. Twenty-one civil engineers are on duty in connection with the project, which will be one of the largest airports in New England, with runways over a mile long.

Samuel Davis, of St. John, N. B., a civil engineer formerly associated with his father, **Harry Davis,** of St. John, N. B., a

general contractor, is now supervisor of outside production at the Noorduyn aircraft plant at Montreal. Mr. Davis is a former student of the Massachusetts Institute of Technology, Boston, and the University of New Brunswick, Fredericton.

Ernest F. Brater, professor of civil engineering, University of Michigan, has been serving with the U. S. Army Engineers on a flood control project in Pittsburgh, Pa., but returns to Ann Arbor this month to resume his teaching duties.

Harold C. Hickman, for the past two years a consultant in engineering economics, is now head of the flood control and hydraulic engineering section of the Detroit office, U. S. Army Engineers.

Burt W. Harvey, formerly with the Macomb County (Mich.) road commission, has recently established an engineering firm in the Ullrichs Bank Bldg., Mt. Clemens, Mich.

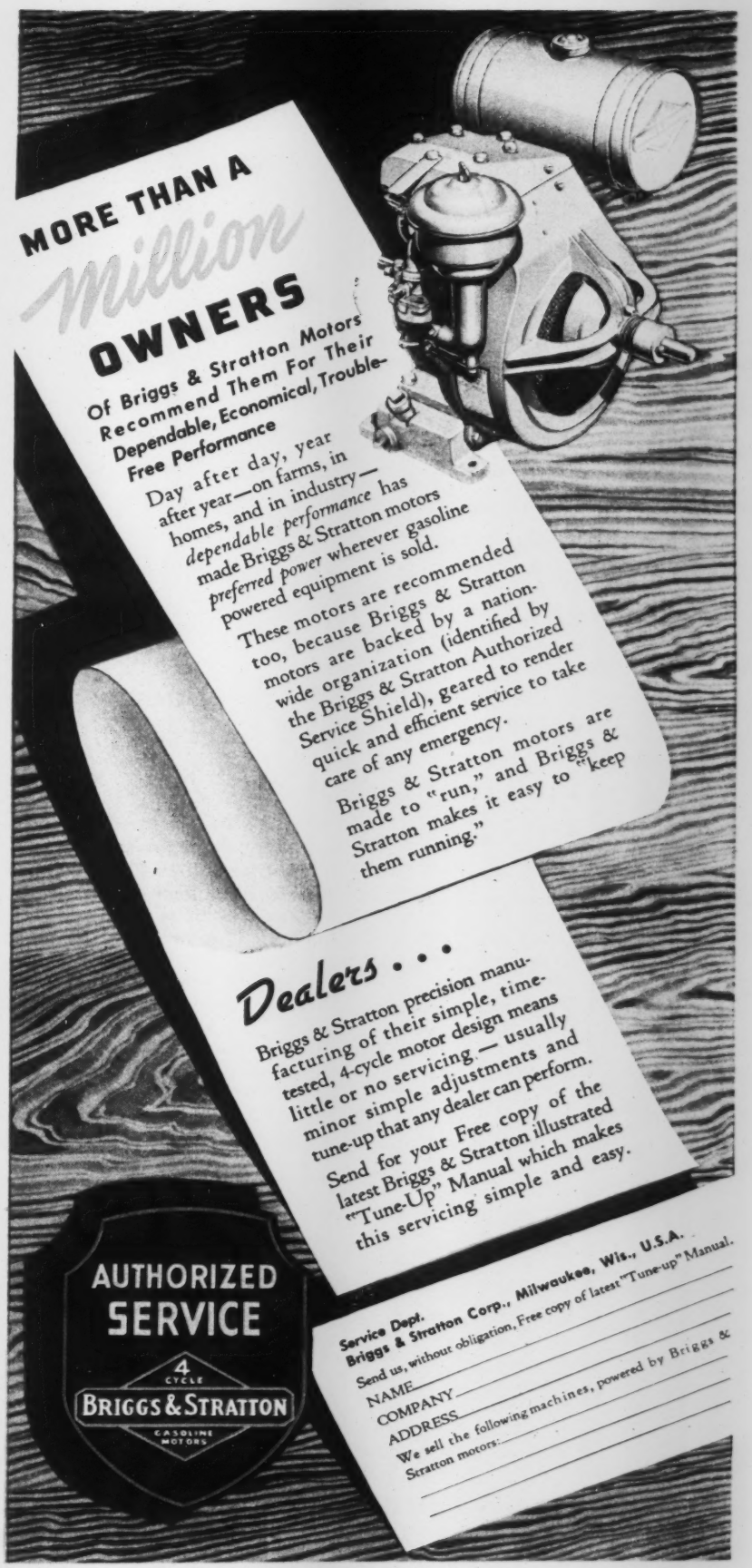
J. G. Hanlin, of Birmingham, Ala., formerly with the safety division of the Alabama department of industrial relations, has been designated by the State Defense Council as consultant on engineering.

L. J. Land, materials engineer for the Alabama highway department at Montgomery, has accepted a position with the federal government in Washington. In point of service, Mr. Land is one of the oldest employees of the highway department. His former duties will be assumed temporarily by **J. F. Tribble.**

Thomas N. Whitford, civil and construction engineer of Los Angeles, Calif., is now engineer in charge of the construction of 1,000 reinforced-concrete igloos at the Umatilla Ordnance Depot near Hermiston, Ore. Previously Mr. Whitford had acted as first assistant to the project engineer on the construction of Camp San Luis Obispo in California.

William B. Thompson will be construction engineer for the Lone Star Defense Corp., a subsidiary of B. F. Goodrich Co., Akron, Ohio, which will build and operate a $79,000,000 arsenal at Texarkana, Tex. A graduate of Ohio State University, Mr. Thompson has been with Goodrich since 1925, and until recently was manager of industrial engineering for the company.

Frederick B. Duis, a civilian engineer in the U. S. Engineers since March 29, 1895, and principal assistant in the office of Lt. Col. Fred T. Bass, U. S. District Engineer, Cincinnati, Ohio, will retire on pension Oct. 31. Entering the service as a surveyman at Chicago,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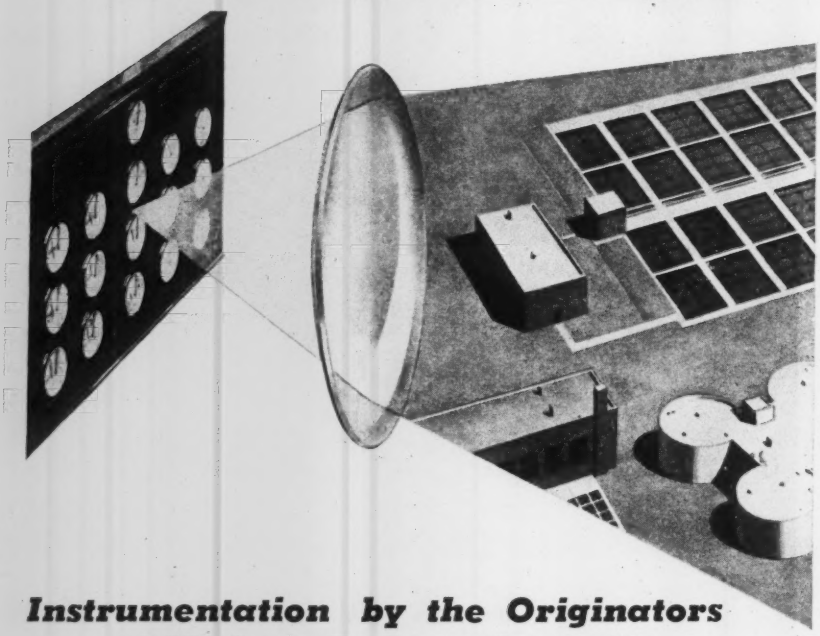

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Write for Bulletin 232 on Foxboro sewage plant instrumentation and Bulletin 233 on water works. **The Foxboro Company, 142 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branches in principal cities of United States and Canada.

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FOR WATER WORKS AND SEWERAGE SYSTEMS

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General Sales Office: Ford Building, Detroit, Mich. Plants: Wyandotte, Michigan

Mr. Duis was first engaged in the district engineer's office at Chicago on the construction of the Illinois and Mississippi Canal and on preliminary designs for the improvement of the Illinois and Des Moines rivers. Promoted through various civil service positions, he served also in the U. S. Engineers offices at Pittsburgh, Wheeling, and Huntington, W. Va., before joining the Cincinnati office in 1934. Since joining the Cincinnati office he has been in charge of the design and construction of locks and dams on the Ohio River and its tributaries.

A signal honor was recently paid to **F. H. Stevens,** veteran engineer, member of the Minneapolis city planning commission. He recently submitted his resignation to that body, expressing the wish to withdraw from active public life. Commission members, by unanimous vote, moved to return the resignation to its maker.

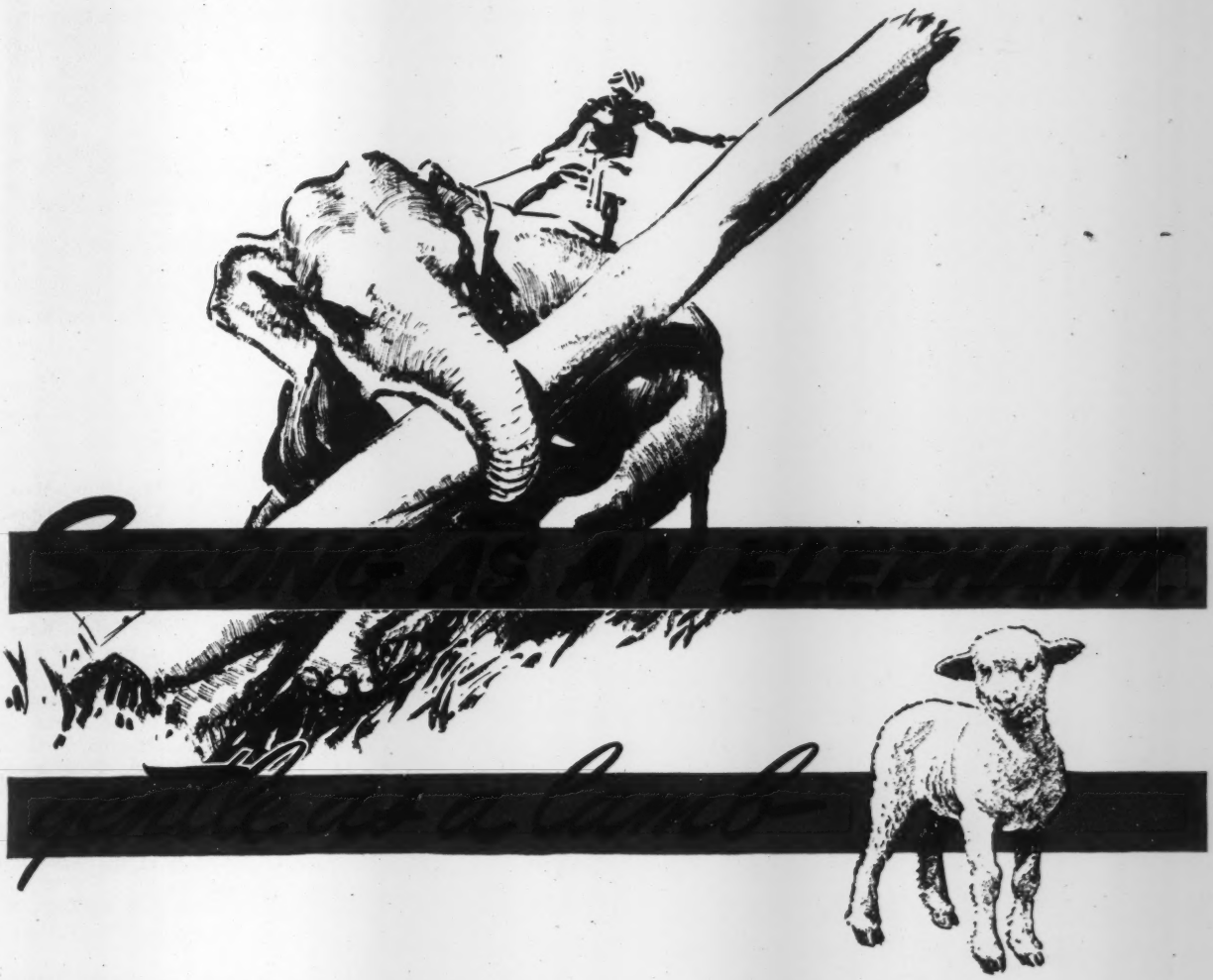
At a recent meeting of the Wyoming State Planning and Water Conservation Board, **L. C. Bishop,** state engineer, was elected board president to succeed **Governor Nels Smith,** who resigned the position due to pressure of other official duties. **N. B. Bennett,** who has been engineer for the past two years, assumed in addition to his duties, the duties of assistant secretary, a position formerly held by **L. R. Tyson,** who recently resigned to accept a position with the Union Pacific Railroad. **George O. Houser,** Department of Commerce and Industry secretary, retains the position of executive secretary. **L. F. Thornton** of Thermopolis was reelected vice-president. The board approved a contract with the U. S. Geological Survey to continue during the coming year an underground water survey of the Council Bluffs, Wyo. area. This notice appeared in *ENR*, July 17, p. 94-96. However, the positions held by Mr. Bennett and Mr. Houser were incorrectly stated.

Dick Horton has been appointed engineer for Stanton County, Kansas, succeeding **James Streeter,** who has resigned. Mr. Horton's headquarters will be at Johnson.

James A. Reinhart, El Reno, Okla., has been named to the combined job of general manager and counsel for the Grand River Dam Authority, subject to the approval of PWA.

Graden Ferguson, city treasurer at Waynesville, N. C., has just been appointed city manager.

W. H. Crawford has resigned as superintendent of Russell County (Ala.) high-

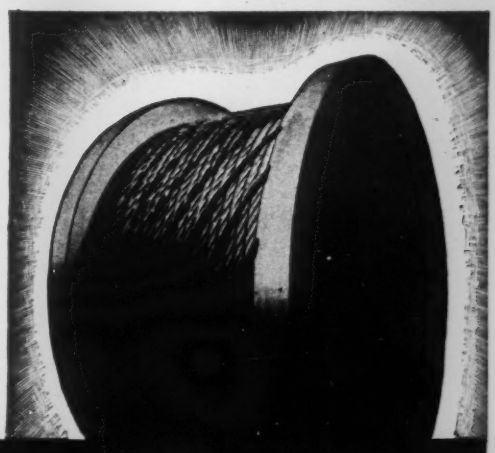


When you buy a wire rope with a purple strand running through it, you get the strongest, toughest steel used in commercial ropes—Improved Plow.

Then, when you specify that this rope be Form-set (pre-formed) you get a rope that's easy to handle, requires no seizing, won't wicker, spools better, is more resistant to bending fatigue.

Extra strength plus easy handling make a combination that can't be beat for the hard-running jobs. Next time you buy . . . how about it?

PURPLE STRAND
FORM-SET
WIRE ROPE



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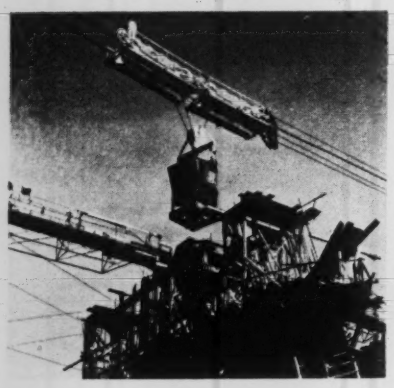
DAMS
Large or Small use

LIDGERWOOD CABLEWAYS

Notably Two Cableways
20 TON Capacity each on
PARKER DAM
at source of
COLORADO RIVER AQUEDUCT



BIG CABLEWAYS
Like this BATTERY of SEVEN are operating on
SHASTA DAM

EST. 1873

LIDGERWOOD MANUFACTURING COMPANY
ELIZABETH·N·J·

way department to establish a private business. No successor to Mr. Crawford has been selected.

S. A. Oliver of Roxboro, N. C., has been made assistant superintendent of the Roxboro water department.

Harry Swanson has been named assistant city engineer of Fargo, N. D., by the city commission. He will act for **W. P. Tarbell,** city engineer, when the latter is absent from the city.

Arthur Shorey, Montesano, Wash., engineer and WPA supervisor of projects in that district, recently resigned his position and has assumed new duties as construction inspector for the quartermaster corps at Fort Lewis, Wash.

John P. Reilly, assistant resident engineer at the Blue Mountain Dam, Yell County, Ark., has been made resident engineer, succeeding **C. A. Hammock,** who was transferred to the operations division of the Little Rock district office.

Charles Wells, of Great Falls, Mont., has been named city engineer of Havre.

Robert W. Christensen, Boston, Mass., and Portland, Me., has been appointed to the staff of FHA's Land Planning Division, and will be stationed at New York. Mr. Christensen was graduated from the University of Maine and the Harvard School of Regional Planning. Until recently he was a member of the technical staff of Boston Planning Board. His duties will include the analysis of subdivisions and home developments for the FHA by operating contractors in New York, New Jersey and the New England section.

J. Monroe Peters, Harrisburg (Pa.), assistant city engineer, has been named secretary of the city planning commission, a part-time post that he will fill in addition to his engineering job.

Elmer Mandrup, Lake Andes, South Dakota who has been county engineer of Charles Mix County for the past four years, has been called to active duty with the U. S. Army, to report to Fort Crook, Neb. Mr. Mandrup will be replaced by **Enoch Norbeck** as county engineer.

Clifford C. Cheney has resigned as municipal engineer of Dansville, N. Y., to engage in the general engineering and contracting business.

Thomas P. Lynch, chief engineer of grade crossing elimination in Dunkirk, N. Y., for the New York Central Railroad Co., has been appointed resident engineer for a $6,000,000 army depot to be erected near Albany, N. Y. **W. L. Morse,** New York, has been named successor to Mr. Lynch in Dunkirk.

Francis X. Kern of Ardmore, Pa., has been appointed project engineer for Pennsylvania's department of highways.

James M. Weber, engineer, regional director of Virginia Unemployment Service at Richmond, has been elected secretary-director of Danville Housing Authority, Danville, Va.

The following officers of the Civil Engineer Corps, U. S. Naval Reserve, have been called to active duty:

Lt. Robert S. Sedon, Quincy, Mass., to active duty at the Naval Air Station, Jacksonville, Fla.

Lt. John L. Washbourne, New York, N. Y., to active duty at the Naval Operating Base, Norfolk, Va.

Lt. Robert M. Belt, Koloa, Kauai, T. H., to active duty in the 14th Naval District, Pearl Harbor, T. H.

Lt. Howard F. Curran, Washington, D. C., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. John J. Delaney, Hastings-on-Hudson, N. Y., to active duty in the 14th Naval District, Pearl Harbor, T. H.

Lt. Edwin A. Duncan, Brooklyn, N. Y., to active duty at the Naval Air Station, Lakehurst, N. J.

Lt. Edwin H. Eaton, Tuckahoe, N. Y., to active duty in the 3rd Naval District, New York, N. Y.

Lt. Theodore W. Friedman, Washington, D. C., to active duty in the 15th Naval District, Balboa, C. Z.

Lt. Kline B. Grigsby, Alton, Ill., to active duty in the 14th Naval District, Pearl Harbor, T. H.

Lt. John E. Kane, Arlington, Va., to active duty at the Naval Training Station, Great Lakes, Ill.

Lt. Palmer D. Koon, to active duty in the 13th Naval District, Seattle, Wash.

Lt. James S. Marsh, Seattle, Wash., to active duty at the Naval Ammunition Depot, Burns City, Ind.

Lt. William E. Parker, Rolling Bay, Wash., to active duty at the Naval Operating Base, San Diego, Calif.

Lt. Charles J. Simandl, Chicago, Ill., to active duty in the 3rd Naval District, New York, N. Y.

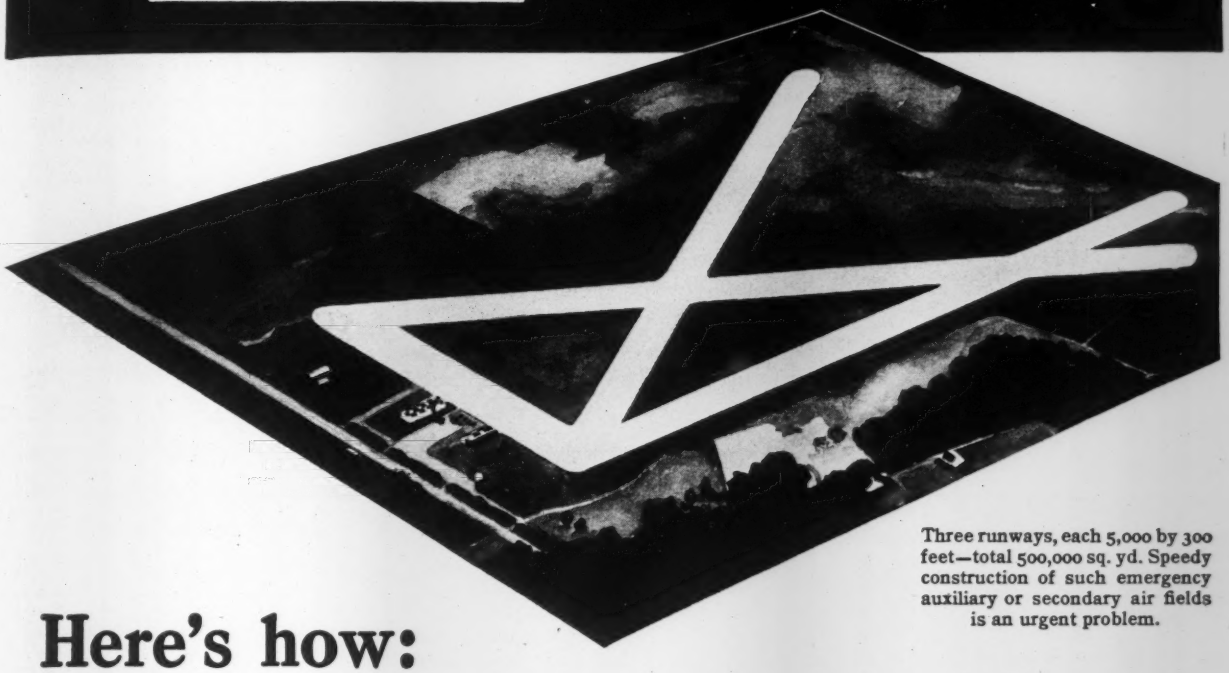
Lt. Charles T. Wende, Seattle, Wash., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. Thomas J. White, Arlington, Va., to active duty at the U. S. Naval Training Station, Newport, R. I.

Ensign Karl W. Brittain, Jr., Savannah, Ga., to active duty in the 6th Naval District, Charleston, S. C.

(*Continued on p.* 130)

500,000 sq.yd. of runways *delivered* in 30 days?



Three runways, each 5,000 by 300 feet—total 500,000 sq. yd. Speedy construction of such emergency auxiliary or secondary air fields is an urgent problem.

Here's how:

specify SOIL-CEMENT!

If it's speed and early use you want on your auxiliary and secondary airport runways, note these facts—

Experience on recent soil-cement construction shows that in 30 working days or less, four soil-cement crews with ordinary, readily available equipment can build half a million square yards of serviceable runways!

Two of these crews can complete a 150 by 5,000 ft. runway in 10 days. Sections can be used for emergency landing 2 days after construction; regular use after a week of moist cover.

Minimum Weather Delay

Soil-cement jobs keep moving! Showers and light rains do not present handicaps that will stop soil-cement construction.

For example: At Tallahassee (Fla.) Airport, between February 25 and April 2, 1941, a single crew completed 96,667 sq. yds. of soil-cement—in spite of rain on 15 of the 32 week days. Fast work . . . early use . . . sure results . . . low cost. That's soil-cement.

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A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

USE LIGHTER Wall Pipe
plain end
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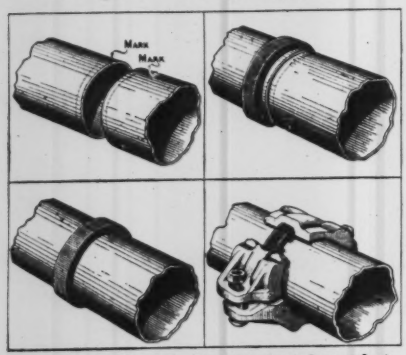
ROLAGRIP
PIPE COUPLINGS

Pipe & Coupling can be Completely Salvaged

SPEED IN ASSEMBLY

Every engineer will appreciate the time and labor saving value of Rolagrips, as well as the economy. Lighter wall pipe can be used, as none is cut away—no special preparation or processing of pipe ends is necessary. Quick, easy installation—only three parts with two bolts; no special training of men and no special tools required. Drawing shows simple application.



Installation easy—simply stretch gasket over pipe ends and bolt housings in place.

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...ranging from 2 in. to 12 in. inclusive, carrying up to 2000 lbs. working pressure. Rolagrips automatically provide for expansion, contraction, vibration and angular misalignment. Write for additional facts.

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Ensign William T. Clampet, Brooklyn, N. Y., to active duty in the 4th Naval District, Philadelphia, Pa.

Ensign Robert B. Hollister, New York, N. Y., to active duty in the 16th Naval District, Cavite, P. I.

Ensign William C. Scheetz, Bala Cynwyd, Pa., to active duty in the 4th Naval District, Philadelphia, Pa.

MEETINGS

PAN-AMERICAN HIGHWAY CONGRESS, fourth exposition, National Stadium, Mexico City, D. F., Sept. 15–24.

ROADMASTER & MAINTENANCE-OF-WAY ASSOCIATION, annual meeting, Stevens Hotel, Chicago, Ill., Sept. 16–18.

CONCRETE REINFORCING STEEL INSTITUTE, 17th semi-annual meeting, The Broadmoor, Colorado Springs, Colo., Sept. 19–20.

INDUSTRIAL RESEARCH INSTITUTE, fall meeting, Hotel Statler, Detroit, Sept. 26–27.

AMERICAN Association of State Highway Officials, annual meeting, Statler Hotel, Detroit, Mich., Sept. 29–Oct. 2.

NATIONAL SAFETY CONGRESS AND EXPOSITION, National Safety Council headquarters, Chicago, Ill., Oct. 6–11, 1941.

FEDERATION OF SEWAGE WORKS ASSOCIATIONS, 2nd annual convention, Hotel Pennsylvania, New York, N. Y., Oct. 9–11, 1941.

FEDERATION OF ARCHITECTS, ENGINEERS, CHEMISTS & TECHNICIANS, 6th national convention, Detroit, Mich., Oct. 10–12.

AMERICAN PUBLIC HEALTH ASSOCIATION, Atlantic City, N. J., Oct. 13–17, 1941.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, annual convention, The Greenbrier, White Sulphur Springs, W. Va., Oct. 14–17, 1941.

AMERICAN SOCIETY OF CIVIL ENGINEERS, fall meeting, Palmer House, Chicago, Ill. Oct. 15–17.

AMERICAN WELDING SOCIETY, Bellevue-Stratford Hotel, Philadelphia, Oct. 19–24, 1941.

AMERICAN PUBLIC WORKS ASSOCIATION, 47th annual conference, Roosevelt Hotel, New Orleans, La., Oct. 26–29, 1941.

NATIONAL COUNCIL STATE BOARDS OF ENGINEERING EXAMINERS, Hotel Pennsylvania, New York, N. Y., Oct. 27–30.

INDUSTRIAL HYGIENE FOUNDATION, 6th

How modern steel ships are planned and constructed

Here is a simple, yet detailed manual of shipbuilding, covering everything that will help the practical worker to understand and better handle the various jobs and procedures of ship construction. Covers every step of construction from ordering materials to launching, with emphasis on the practical details of mold and template work, fabrication of hull material, welding, riveting, etc.

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PRACTICAL SHIP PRODUCTION

By A. W. Carmichael, Formerly Commander, Construction Corps, U. S. Navy. New 2nd Edition. 283 pages, illustrated. $3.00

THE book begins with the simplest form of a floating body, and, in developing its evolution into a modern ship, introduces requirements naturally that give the reader a practical understanding of special aspects of ship design and construction.

The building, launching, and fitting out a ship is fully described, both for a riveted and a welded ship. The practical methods of making molds and templates, fabricated parts, erection, etc., are explained in step-by-step detail. The subject of welding is covered fully because of the great increase in this type of ship construction.

- Tested as an efficient manual in shipbuilding activities following the last war — now available in a fully revised and up-to-date second edition.
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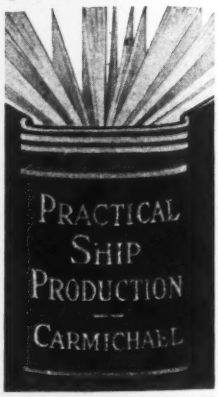

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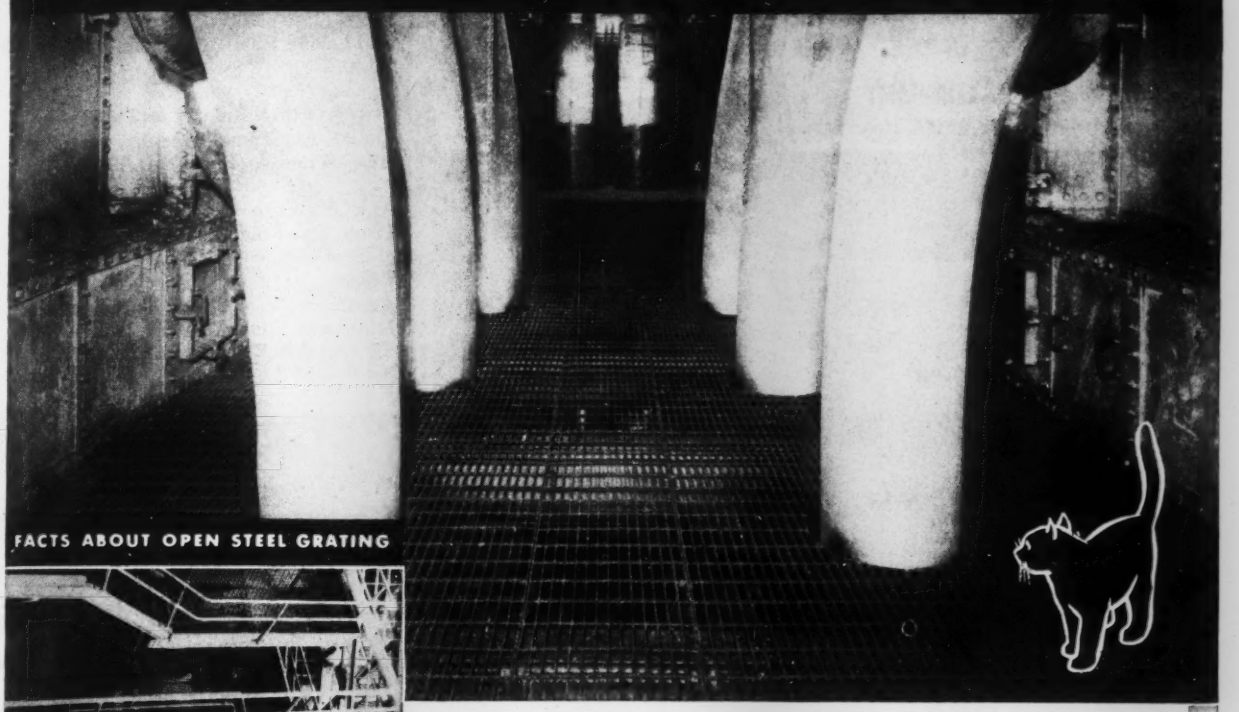
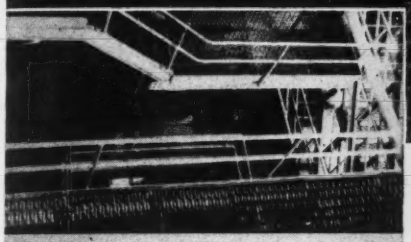
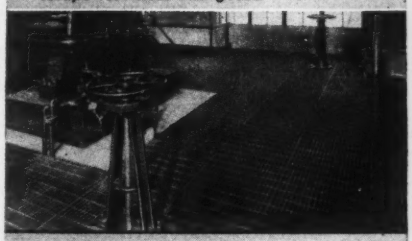


FACTS ABOUT OPEN STEEL GRATING



FREE CIRCULATION OF LIGHT AND AIR. Because of its construction, Open Steel Grating lets light through to spaces above and below—gives free ventilation and escape for fumes and gases.



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TO insure a perfect "tailor-made" fit and to reduce the time required for installation, most Open Steel Grating Floors are factory-fabricated to the exact dimensions and requirements of the individual job. Stock sizes of grating are also available, where the job does not necessitate this "tailor-made" accuracy. Fastening devices are installed from the top surface—eliminating the use of scaffolding.

Floors of Open Steel Floor Grating are factory-fabricated from a combination of structural steel members rigidly connected by welding, interlocking or riveting. Though strong and rigid, their weight is the minimum necessary to carry and distribute a given load with an ample factor of safety.

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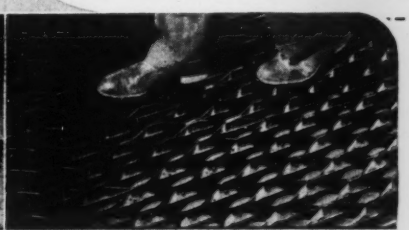

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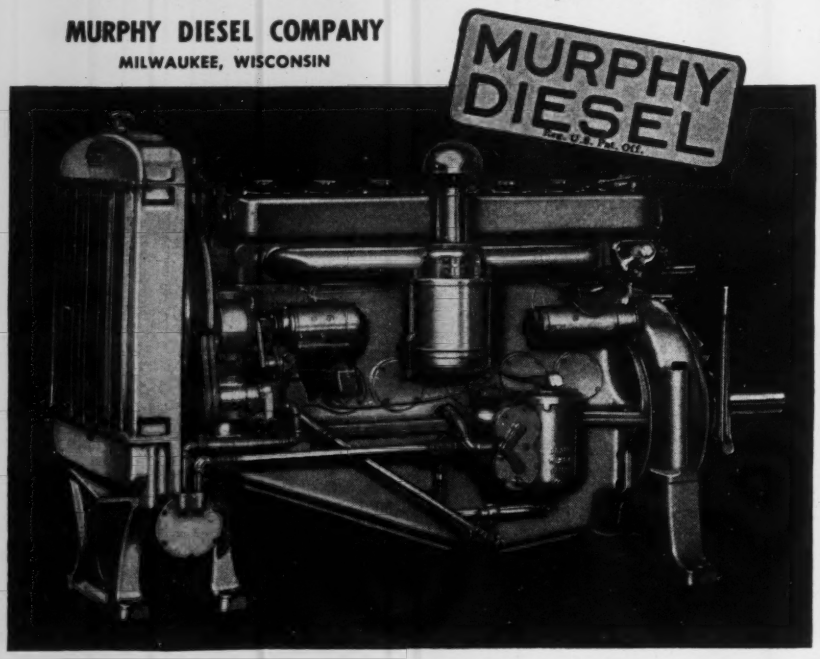
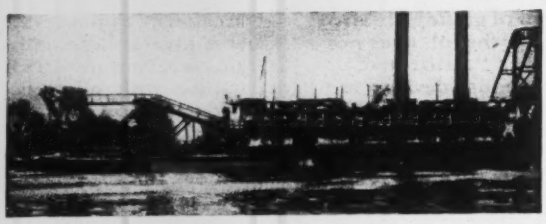


DREDGING



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annual meeting, Mellon Institute, Pittsburgh, Pa., Nov. 12–13.

REGIONAL AND LOCAL MEETINGS

OHIO CONFERENCE ON SEWAGE TREATMENT, 15th annual conference, Mansfield-Leland Hotel, Mansfield, Ohio, Sept. 18–19.

PENNSYLVANIA SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Hotel Jermyn, Scranton, Pa., Sept. 19–20.

NEW ENGLAND WATER WORKS ASSOCIATION, Hotel Statler, Boston, Mass., week of Sept. 23–26.

AMERICAN WATER WORKS ASSOCIATION, Minnesota Section, Minneapolis, Oct. 9–11; New Jersey Section, Atlantic City, N. J., Oct. 16–18.

MISSOURI SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Hotel Statler, St. Louis, Mo., Oct. 17–18.

WEST VIRGINIA SOCIETY OF PROFESSIONAL ENGINEERS, Bluefield, W. Va., Oct. 23–25.

ILLINOIS WATER PLANT OPERATORS, 9th annual fall meeting, Leland Hotel, Springfield, Ill., Oct. 28–29.

WATER AND SEWAGE WORKS CONFERENCE, 7th annual meeting, Aberdeen, S. D., Oct. 28–29, 1941.

TEXAS SECTION, Am. Soc. of C. E., fall meeting, Fort Worth, Oct. 31–Nov. 1.

ENGINEERING SOCIETY OF WESTERN PENNSYLVANIA, annual conference, William Penn Hotel, Pittsburgh, Nov. 3–4.

NORTH CAROLINA SECTION, American Water Works Association, High Point, N. C., Nov. 3–5.

ILLINOIS ASSOCIATION OF HIGHWAY ENGINEERS, 1941 convention, Abraham Lincoln Hotel, Springfield, Ill., Nov. 9.

ELECTIONS AND ACTIVITIES

A quarterly directors meeting of the National Society of Professional Engineers will be held Sept. 27 in Indianapolis, Ind. This will be the first time it has been held outside Washington. Future meetings will be in other states, to give state societies an opportunity to get acquainted with the national officers.

EXAMINATIONS

IOWA State Board of Engineering Examiners will hold professional engineering examinations Sept. 16–17 and land surveying examinations Sept. 18, at State House, Des Moines.

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PORTABLE ELECTRIC HAMMER

Thor PORTABLE POWER TOOLS

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Capacity in Concrete 1" Star Drill
Blows per minute 1600
Length Overall 13½"
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Other Thor *Contractors Tools to Speed Your Work!*

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A complete range of six models. The new THOR Pigtail Rubber Bumper and THOR Cylindrical Rocker Valve are two of many features that speed up work.

PAVING BREAKERS

Four hard hitting machines, ranging in weight from 32 to 84 pounds.

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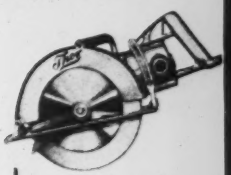
There are 13 different models of THOR Sinkers, Stopers, and Drifters. Light, medium, and heavy duty types. Wet and dry operation.

SUMP PUMPS

Self-priming, centrifugal impellor type pumps that operate efficiently under the most unfavorable conditions.



ELECTRIC SAWS

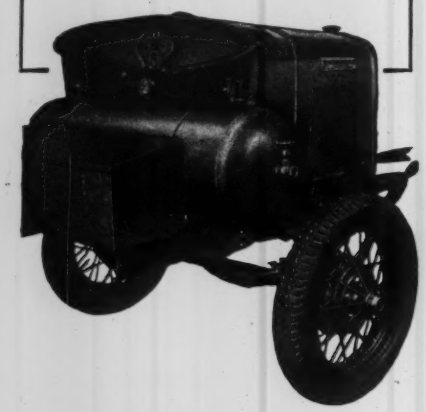
Seven powerful models for cutting and grooving in wood, metal, stone, and compositions. 6, 7, 9, 10, and 12 inch blades.

"Going Good

and making GOOD MONEY for us", says W. C. White & Son, Dayton, Ohio about their two

SMITH AIR COMPRESSORS

RIGHT NOW, think of the savings you'll enjoy with these lightweight, sturdy compressors! BIG savings in purchase cost over standard compressors of equal capacity . . . important savings on upkeep too! Made with FORD Motors and standard parts. That means dependability and economy. Repairs and parts at Ford garages everywhere. . . In service, 60 cu. ft. size Smith Compressors use only 1 gal. of gasoline an hour! Easily portable - tow them from job to job at permissible truck speeds. No couplings, belt, clutch or gears to wear and give trouble. Head equipped with high speed compressor valves; automatic unloading and idling. . . Write today for complete catalog that gives you the facts!



With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

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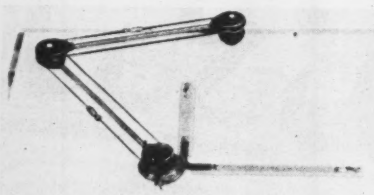
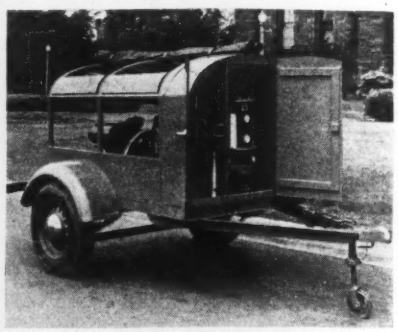


Drafting Machine

Post has a new "True Line Drafting Machine," said to be the answer to the draftman's problem. Built to hairline accuracy, this machine embodies the following instruments used to make a drawing—protractor, vernier, T-square, scales and triangles. It is easily and conveniently operated and eliminates smudging and blurring caused by moving instruments over the drawing. The machines are equipped with "Quick Flick" controls; a flick of the thumb from its natural position, and the scales are released for 15-deg. automatic stops, or for intermediate stops and locking. The design permits the use of the instrument with the elbow at the left or right, and the protractor may be used at any angle in the complete circle.—*The Frederick Post Co., Box 803, Chicago, Ill.*

Welding Electrodes

Tournaweld Electrodes, developed and made in the LeTourneau plant expressly for the various welding applications used in the manufacture of LeTourneau equipment, is now available for general maintenance work. Tournaweld electrodes have been proved by almost two years of use in LeTourneau plants, being found superior to any other available rod for welding of mild steels and the special analysis steels used in the manufacture of LeTourneau products—*Letourneau-"Caterpillar" distributors.*



Mobile Chlorinator

A trailer type mobile chlorinating unit, designed to provide positive protection of water supplies under emergency conditions or to meet other temporary needs for chlorination is now available. The unit provides for closely controlled solution feed of chlorine over a wide range

"Morok" Portable Super Quarry Crushing Plant

The portable quarry plant shown above is built in three major units for capacity of 150 to 200 tons per hour; it is completely mounted on pneumatic tired trucks for easy transportation; and is designed for fast setting up. The primary unit is a heavy-duty rock feeder and jaw crusher which handles rock direct from the quarry; a belt conveyor takes the crushed material to the secondary plant; here a roll crusher and secondary jaw crusher handle the material, delivering it to a 48 x 12-ft. horizontal vibrating screen. Aggregate from the secondary plant is conveyed to the bin unit, where a second 48 x 12-ft. screen does the final grading over a 40-yd. compartment bin. Power for operation of the "Morok" may be all electric or a combination of diesel plus electric. Bulletin SRP-1 gives complete details.—*Iowa Manufacturing Co., Cedar Rapids, Iowa.*

"Going Modern" with STEEL

insures a constant, dependable service . . . and lower maintenance cost!

IT is highly significant that many cities and municipalities in all parts of the country are specifying STEEL PIPE. This applies to new lines as well as replacements. Mounting experience proves that STEEL PIPE is the only water line material that offers dependable protection against the many uncontrollable hazards that affect operating economy and efficiency of water line systems. The high tensile strength and unusual ductility of NATIONAL Steel Pipe assure security against such dangers as: trench pressures, shocks, cave-ins, earth settlement, traffic vibrations, and other external forces.

NATIONAL Steel Pipe will not break or shatter! It costs less to lay because steel pipe is lighter and easier to handle. It is available in longer lengths, which mean fewer joints. Smooth interiors reduce friction loss and give full flow capacity. Pipe linings and coatings furnished in accordance with A.W.W.A. Specifications.

THE LONG-LIFE AND EFFICIENCY *of this Pennsylvania city's water system is secured by* NATIONAL *Steel Pipe. Here's the best possible protection against costly replacements.*

Factors responsible for continued trend to Steel Water Pipe . . .

1. HIGH STRENGTH. Withstands high pressures, heavy trench loads, vibrations, shocks, washouts, water hammer and other emergency stresses.

2. LONG LENGTHS. Fewer joints per mile, faster laying, less damage to pavement, lower water loss.

3. LIGHT WEIGHT. Saves freight and trucking charges. Speeds laying. Cuts laying costs.

4. SHATTERPROOF. Eliminates sudden ruptures in case of fire and emergencies. Reduces property damage.

5. SMOOTH SURFACE. Ideal for linings or coatings, where necessary. Greater carrying capacity.

6. LONG SERVICE. Line after line is proving that Steel Pipe continues to give good service years beyond the original estimated service life.

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That's why manufacturers and users of all types of industrial machinery entrust their clutch problems to the Twin Disc Clutch Company's 23 years of specialized experience in building clutches *to fit the job . . . not merely to fit the machines of which they are a part*. Why not submit your clutch problem to Twin Disc engineers? Twin Disc Clutch Company, 1327 Racine Street, Racine, Wisconsin.

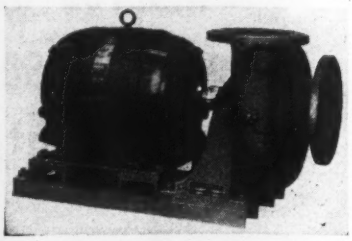
This single point adjustment is an exclusive feature in ALL Twin Disc Clutches. Easy and quick . . . no special tools needed. Simply pull up the pin, rotate collar to next hole and release the pin.

Lower Left: *Twin Disc Model E Heavy-duty Clutch.*

Below: *Twin Disc Model MT Duplex Machine Tool Clutch.*

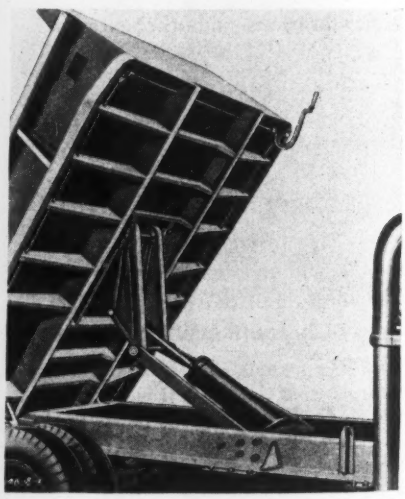
Lower Right: *Twin Disc Power Take-off.*

of application rates. The chlorinator employs the W & T vacuum principle and is powered by a 5-hp. gasoline engine mounted on the trailer. The chlorinator is equipped with a complete set of accessories for emergency use in connection with the main, and has all necessary tools for the work, as well as carrying two 150-lb. chlorine cylinders on the trailer. Gross weight, including two 150-lb. cylinders, is 2150 lb.—*Wallace & Tiernan Co., Inc., P. O. Box 178, Newark, N. J.*



Horizontal Motor-Driven Pump

Fairbanks-Morse have announced a new line of horizontal short-coupled base mounted pumps for lowhead irrigation service. The standard unit is supplied complete with motor, base and coupling. The pump is so constructed that no bearings are necessary in the pump itself and the motor bearings are grease packed at the factory to assure a minimum of attention and maintenance. Features of the outfit are easily adjustable impeller, F-M ball-bearing motor, and a design which permits passage of large solids. The entire unit is designed and built by F-M, thus centering responsibility for satisfactory performance in one reliable manufacturer.—*Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.*

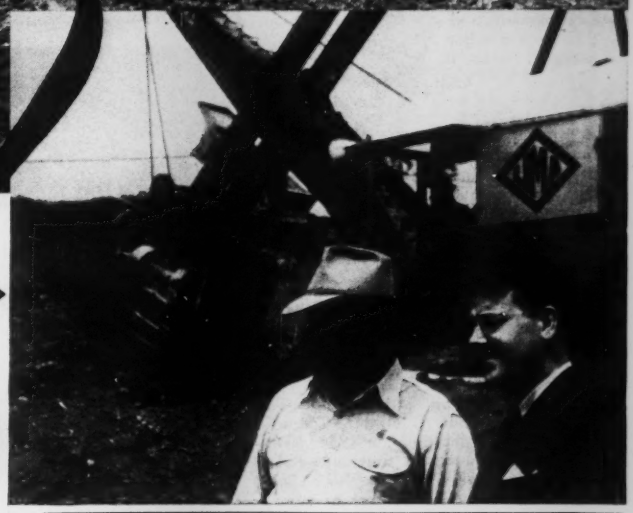


Truck Body Hoist

Gar Wood is manufacturing arm-type hoists in three sizes for installation on 1½ to 2 ton truck chassis especially

Gulf helps do a speedier, more profitable job"

. . . says contractor on airport project *



"With Gulf quality lubricants and fuels in service, we get efficient performance from our equipment and avoid unnecessary delays. Result: We're well ahead of contract schedule — and have an excellent cost record."

*Mauger Construction Company of Columbus, Ohio, and Charleston, West Virginia, and the Samons Construction Company (associated with the foregoing) of Huntington, West Virginia, are ahead of schedule on this huge airport project at Cumberland, Maryland. Gulf lubricants and fuels are helping them attain an efficient operating record.

"WITH Gulf quality lubricants and fuels in service, we're getting efficient, trouble-free performance from our equipment on this airport project," says this contractor. "In addition, our operating and maintenance costs are low — so, thanks to Gulf, we're doing a speedier, more profitable job."

Are you entirely satisfied with the recent operating record of *your* equipment? If not, make sure that on your next job you get the benefits of Gulf quality lubricants and fuels. They are quickly available to you through more than 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

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By CARLTON T. BISHOP

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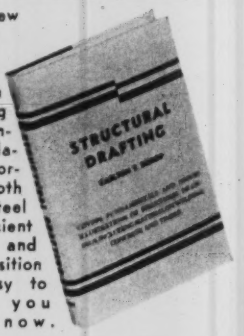
This is a new book covering good modern practice in the drafting room. It includes fundamental information on both timber and steel work. Efficient arrangement and clear exposition make it easy to find what you want to know.



A random listing of some of the questions to which "Structural Drafting" provides the answers shows the scope of the book: Pointers on using drawing instruments—The technique of drawing dimension lines—Shipping marks, erection marks, assembling marks—Proportioning a latticed girder—Working drawings for steel beams — Formulas for hip and valley rafter connections—Arrangement of items for shop bills—Suggestions for checking and correcting drawings.

"Structural Drafting" is the companion volume to Carlton T. Bishop's "Structural Design," published in 1938. Both are derived from the previously-published "Structural Drafting and Design," now permanently out of print.

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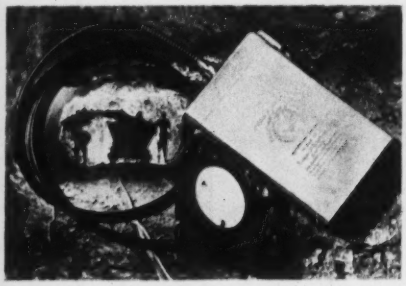
adaptable for use in connection with dump bodies from 8 to 10 ft. long. The lifting effort is reduced considerably, due to the force being applied further forward on the body than with the conventional arm-type units. Bulletin 29 describes the new model.—*Gar Wood Industries, Inc., Hoist and Body Div., Detroit, Mich.*

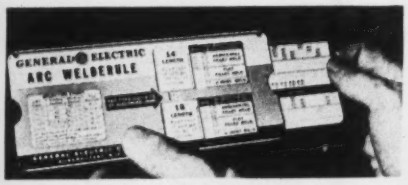
Controls for Chemical Feeders

An electrically-operated chemical proportioner has been developed particularly for proportioning a number of individual chemicals to water conditioning systems in accordance with makeup requirements. In this combination a swing-pipe chemical proportioner is controlled from a Cochrane electric flow-meter provided with contacts on the integrator train. When the predetermined quantity of water has passed through the meter orifice, the integrator closes a contact in the electrical circuit, including a time-cycle relay. Time for which proportioning motor is to run is controlled from a panel-front knob for each chemical. Ask for Publication 3015, which gives the details.—*Cochrane Corporation, 17th St. & Allegheny Ave., Philadelphia.*



Miner's Lamp

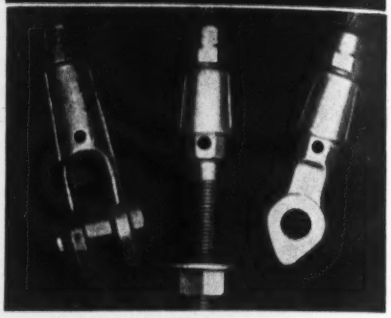
The miner's lamp illustrated employs Republic Enduro stainless steel in the construction of the storage battery container. This material resists to a great degree the severe corrosive action and the bumping and scraping which necessarily accompany underground work in tunnels, sewers, etc.—*Thomas A. Edison, Inc., West Orange, N. J.*



Arc Welder Rule

General Electric has made available an "Arcwelder" rule to save time in estimating electrode requirements. Operating similar to a slide rule, the device

PROLONG the LIFE of WIRE ROPE with *Electroline* FIEGE CONNECTORS



SAFE, strong, streamlined, Electroline-FIEGE Connectors are being rapidly adopted by the Construction Industry because their design damps vibration stresses and thus prolongs the life of wire rope. This unique gripping unit "holds like a bulldog" with a graduated compression which feathers off from maximum at rear to zero at front, so that lines held by these connectors are not subject to "weak point" crystallization and consequent failure.

The complete line of Electroline-FIEGE Connectors, available in black and stainless steel, bronze, and monel metal, is fully described in a new 8-page Bulletin, a copy of which will be sent you at your request. No obligation—send for the book today.

Electroline Company
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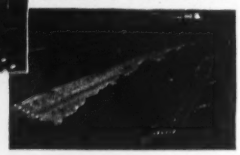
KEEP YOUR CONVEYOR BELTS GOING



FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.

● Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco belt fasteners. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

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Sold by supply houses everywhere

GENERAL

keeps the trucks moving for the Diano Supply Company of Canton, Ohio. This is one of three GENERALS operated by this aggressive organization. Try the GENERAL for real profit.

THIS GENERAL TYPE 30

with Twin Disc swing clutches, swings away all day, and day after day, without clutch trouble. If you have to do a lot of swinging to keep the job moving, try a GENERAL Type 30.

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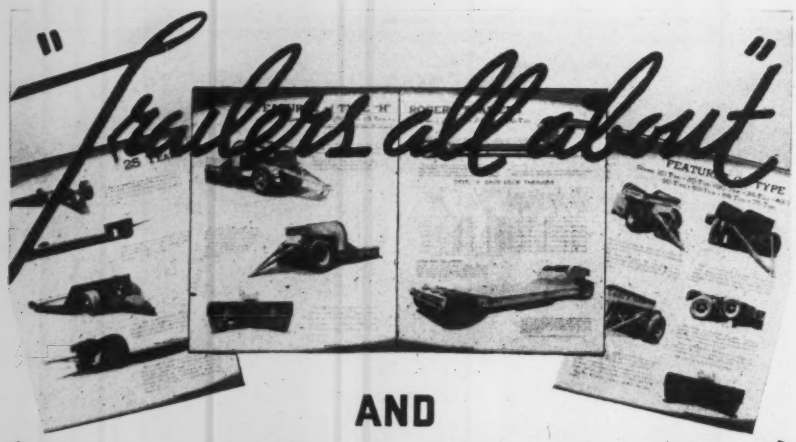

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We feel justified in saying that this is by far the most comprehensive catalogue of heavy trailers ever published and we feel sure you will want a copy. Then, just send your name and address.

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can reduce your construction costs. It is efficient and dependable, an established product.

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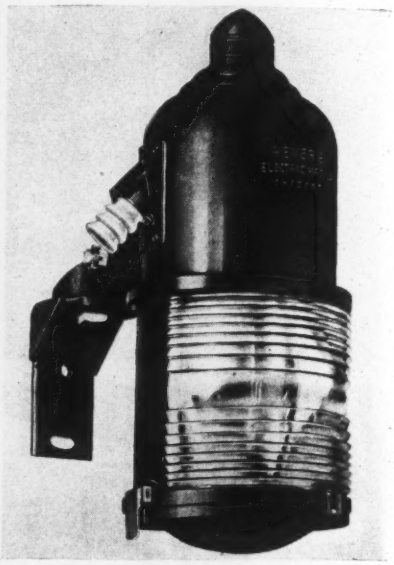
reads directly the length of arc welded joints obtainable per 100 lb. of electrode and the pounds of weld metal deposited per 100 lb. of electrode. The information covers 11 different commonly used sizes and types of joints and 22 different sizes and types of popular electrodes in both the 14- and 18-in. lengths. A feature of welder rule is a selector chart which shows the various filler metal classifications as specified by the American Welding Society and the types of electrodes which meet these classifications. Available from—*Any G. E. Arc Welding Distributor, G. E. Sales Office, or from General Electric Co., Schenectady, N. Y.*



Anti-Sabotage Floodlight

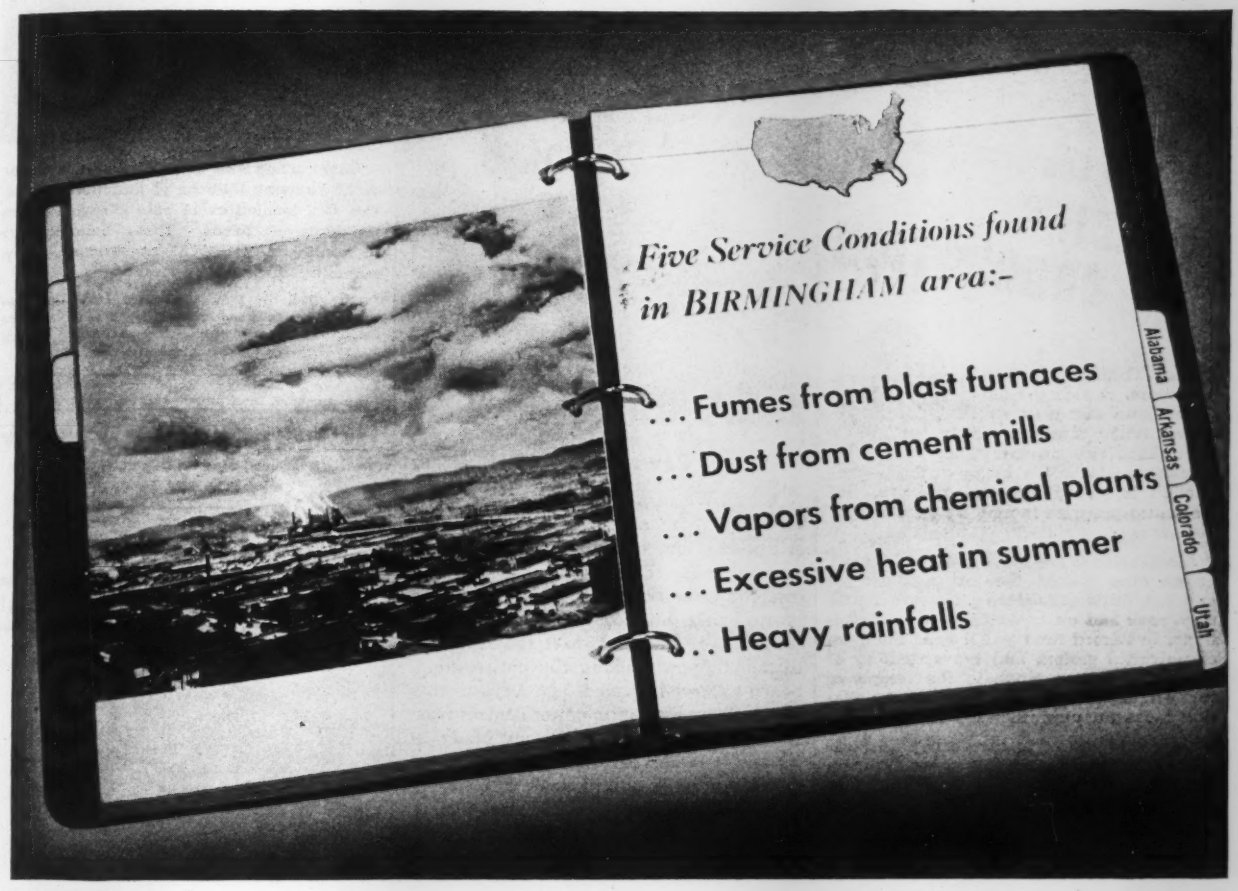
A new floodlight, designed for use at guard fences around munitions plants and other strategic industrial areas, has a weathertight unit which contains aluminum reflector and fresnel lens to produce an intense beam covering approximately 10 deg. vertically, and 180 deg. horizontally. It is available for 300-watt standard clear lamps or for series operation with street lighting lamps. This type of anti-sabotage floodlighting makes an intruder clearly visible from the patrol road at a distance of 500 ft., while the intruder sees only an impenetrable glare from any angle of approach.—*Revere Electric Mfg. Co., Chicago, Ill.*

Universal Spectrophotometer

The Coleman Universal Spectrophotometer is designed to take the place of a high-grade chemist's colorimeter and is said to be much more accurate and better suited for the job than the older instrument. The new product was designed with particular attention to photometric precision, adequate spectral purity being assured by single grating monochromator. The product is designed to

ANOTHER PAGE IN THE STORY OF "BAKELITE" RESIN COATINGS

and how they meet rigid government and industrial specifications the country over



ONE OF THE LEADING iron and steel manufacturing centers in the United States, Birmingham, Alabama, is justly termed the "Pittsburgh of the South." Protective coatings for industrial buildings in this area are subjected to severe service conditions. Sulphurous gases, smoke and dust from both steel and cement mills, acid and alkaline vapors from chemical plants . . . all these factors are now greatly accentuated by increased production. Local weather conditions, such as excessive heat and heavy rains, add still further to paint deterioration.

Industrial plants the country over may now secure greater protection against such conditions by specifying coatings *fortified* with BAKELITE Synthetic Resins. Developed by leading paint and varnish manufacturers in co-operation with Bakelite Laboratories, these durable primers and top-coats meet the most exacting government and industrial specifications. They are helping to keep to a minimum the maintenance of both buildings and operating equipment.

Bakelite Laboratories welcome the opportunity of assisting you in formulating specifications to solve specific coating problems. Write for Booklet 11S, "BAKELITE Synthetic Resins," and Bulletin 17, "Specifications for BAKELITE Resin Finishes."

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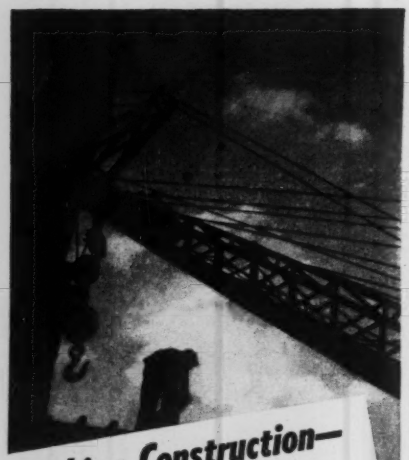
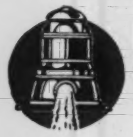


Rushing Construction—

SPEEDING PRODUCTION



CLATTERING air hammers, roaring bulldozers and clanging well casing noise dins the air throughout the country. Defense projects are being rushed—production is going up,—up—and up! But the entire program is moving on a simple life necessity—Water!

Almost before the first transit is leveled, Layne men are on the job, rigs are up and the drills are biting through soil, clay, rock and on to water bearing formations. In record time you'll hear the hum of powerful motors and the splashing of cool clear water. Such is the tempo of today's unparalleled activity as the Nation faces an unpredictable future.

Keyed to the ever increasing and extremely urgent need for speed in production is Water! And wherever the Pump and Well is of Layne build, there you will find dependable performance no matter how heavy the load or prolonged the run.

Never has the Layne Organization been so keenly alert to its task of producing great quantities of water with utmost speed. Never has it been operating more efficiently. If you need more water to further speed production, write or wire

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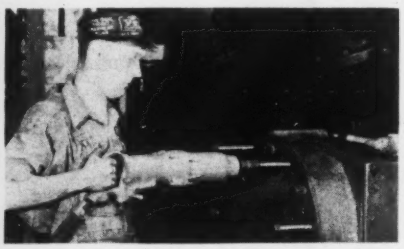
accept a great variety of cuvettes so that sample depths ranging from 0.5 to 50 mm. may be employed. The model may be operated with constant voltage transformer from any suitable 110-125-v. 60-cycle line.—*Winkens Anderson Co., 111 No. Canal St., Chicago, Ill.*

Recording Chart

A new I-EZ Permochart is made in three colors of "Vinylite" plastic so colored and shaded as to reduce glare and eyestrain to a minimum. This is for use on a recently improved design of recording instrument chart made for continuous reuse.—*Permochart Co., 450 Chestnut Road, Sewickley, Pa.*

Power Grader

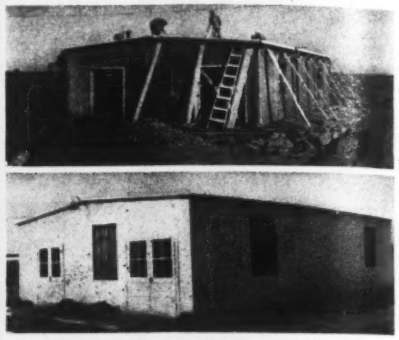
Austin-Western announces a new, 99-M all-wheel drive and steer power grader. All wheels are equipped with large diameter tires, equal size for convenient interchangeability. The 99-M can grade steep banks and ditch slopes, using a long blade, and can offset the frame to distribute power along the entire moldboard to move heavier loads. Adjustments are made by hydraulic power control from the cab, including shifting the blade on its arms; reversing circle; steering front and rear wheels, and raising and lowering the blade. Hydraulic power operates available accessories, as scarifier, loaders, roller, bulldozer, snow plow and snow wing. The machine can be furnished with either diesel or gasoline power—*Austin-Western Road Machinery Co., Aurora, Ill.*



Impact Wrench

I-R announces the Size 534 new and improved air-operated impact wrench for use in applying and removing nuts up to 1¼-in. bolt size. It is designed with patented Pott impact wrench principle

PUMPING STATION IN TEXAS



Construction and completed photos of one of 11 Pumping Stations of the Atlantic Pipeline Co., located at 44 mile intervals across the state of Texas. These buildings are of reinforced "GUNITE" construction, solely, including the roofs.

Our Bulletin 1200 describes and illustrates many similar uses of "GUNITE", as well as numerous other applications. Send for a copy today.

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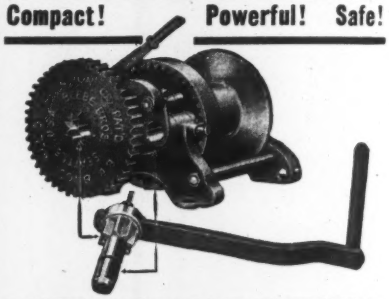

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SEATTLE, U.S.A.

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Money Has Been Saved on These Jobs!

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.
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Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

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When raising, lowering, or placing costs by power are a serious problem, the answer is the right number of Beebe Bros. All Steel Hand Hoists MANNED IN UNISON. Available in 2, 5 and 15 Ton sizes. Sold through leading dealers in all trade centers. List of dealers sent upon request.

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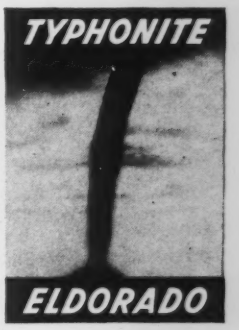
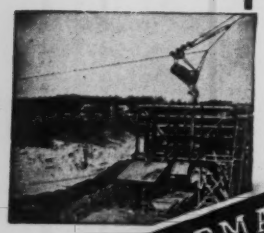
The shortest distance between

IS DIXON'S TYPHONITE ELDORADO PENCILS

This is due to *Typhonite*—a new form of natural graphite. The *Typhonite* process, exclusively Dixon's, creates incredibly minute, even particles in a typhoon of super-heated steam. These same particles flow from your Eldorado point in an even, opaque line that results in blueprints of extraordinary clarity. They bring brain, pencil point and paper closer than ever before.



PENCIL SALES DEPARTMENT 227-J9, JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY, N. J.



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. . . handle all kinds of materials at LOW COST!

SAUERMAN Machines assure maximum economy by combining three operations in a single continuous movement — digging, hauling, and dumping with unequalled effectiveness.

Here's efficiency plus. Costs are cut to the barest minimum as the machines are easily operated by one man, maintenance is simple, and the original cost is lower than for any comparable machines.

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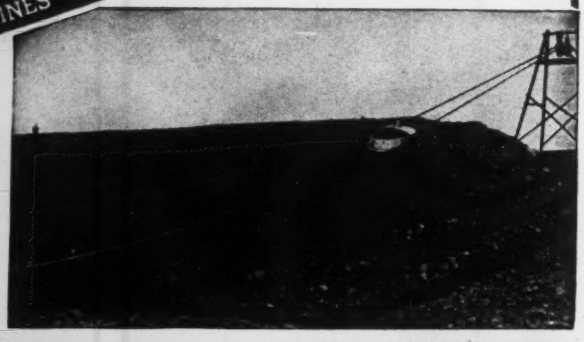
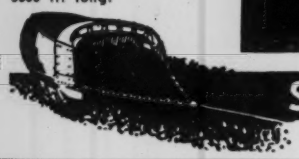
ABOVE — In Finland, this SAUERMAN Slackline Cableway moves clay from a deep pit to carloading hopper.

RIGHT — A 1½ cu. yd. SAUERMAN Scraper Machine, with head tower mounted on rollers, builds an earth dam 30 ft. high, 5600 ft. long.





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FOUNDATIONS OF BRIDGES AND BUILDINGS

By **Henry S. Jacoby**, Professor Emeritus, Cornell University, and **Roland P. Davis, Dean**, College of Engineering, West Virginia University. New 3rd Edition. **535 pages**, illustrated. **$5.00.**

CONTENTS: 1. Soil Explorations and Bearing Capacity. 2. Some Fundamentals of Soil Mechanics. 3. Timber Piles and Drivers. 4. Driving and Protecting Timber Piles. 5. Bearing Power of Piles. 6. Concrete Piles. 7. Sand, Metal and Sheet Piles. 8. Cofferdams. 9. Box and Open Caissons. 10. Pneumatic Caissons for Bridges. 11. Pneumatic Caissons for Buildings. 12. Land Foundations in Open Excavation and Control of Water. 13. Spread Foundations. 14. Bridge Piers. 15. Double-shaft and Pivot Piers. 16. Bridge Abutments. 17. Underpinning Buildings.

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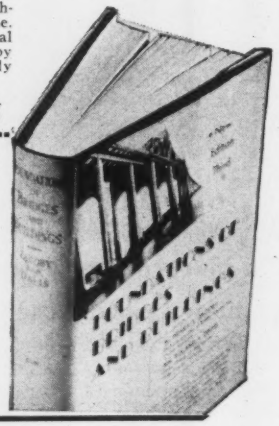

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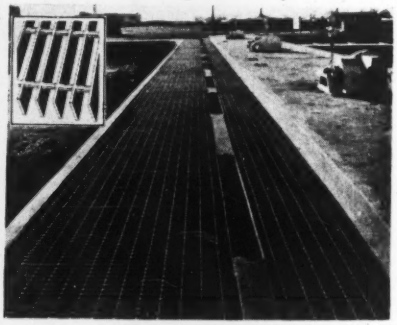
which localizes the steel to steel impact without transmitting the shock to other parts of the tool. Smooth, balanced power with negligible torque reaction makes possible safe and convenient one-hand operation. A new booklet, Form 2758, describes this wrench and a complete line of five sizes for applying and removing nuts from ¼ to 1¾-in. bolt sizes.—*Ingersoll-Rand Co., 11 Broadway, New York, or any branch office.*

Wilson Pulsafeeders

Developed after many years of chemical feed engineering, the new Pulsafeeder is considered extremely well designed for an accurate hypo-chlorinator, according to the manufacturers. Advantages claimed for the Pulsafeeder are: accuracy obtained by positive displacement feed; micrometer feed adjustment possible with feeder in operation makes for good control; and trouble-free performance is obtained by elimination pressure piston packing glands or mechanically operated diaphragms. Pulsafeeder is fitted with a micrometer stroke control calibrated in millimeters and instantly adjustable. The average size Pulsafeeder has over one thousand distinct settings, and the minimum increment of adjustment is 0.0277 of a millimeter. Some machines will deliver accurately as low as one cubic centimeter per hour, while others a maximum of 75 gal. per hour.—*Wilson Chemical Feeders, Inc., Buffalo, N. Y.*



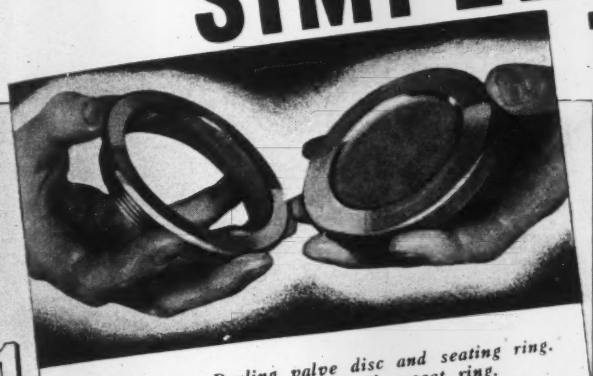
Steel Grating

Safety, rigidity, durability, self-cleaning, and easy sure-footed travel are claimed for a new one-piece welded steel grating recently put on the market. This grating is made of hot rolled hexagonal steel bars placed at right angles on top of flat bearing bars set on edge, and then electro-welded under pressure. The resultant product is a solid, one-piece construction of great strength. Fabrication is accomplished without removal of any of the metal by intermittent welded method with positive heat control. Full descriptive literature is available with safe loads and tables.—*Wm. F. Klemp Co., 6611 S. Melvina Ave., Chicago, Ill.*

SIMPLE TEN-SECOND TEST

of Factory Stock Parts PROVES DARLING SUPER-MACHINED SURFACES

—and shows what "tight-closing" really is!



1 *Take any new Darling valve disc and seating ring. Or, tapered wedge and valve seat ring.*

2 *Place the ring seating surface down on top of the disc face—forming a "cup". Note even joint of smooth uniformly-machined surfaces.*

3 *Pour water into the "cup". Though gravity alone holds the ring to the disc, not a drop of water escapes!*

4 *Even when you revolve the ring on top of the disc, the closure remains water-tight!*

It's another proof of

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Once again, pictures speak louder than words. Nothing we could say about Darling's accurate machining would be half so eloquent as the proof in this test—showing surfaces so smooth they make a water-tight seal simply by *"meeting"*.

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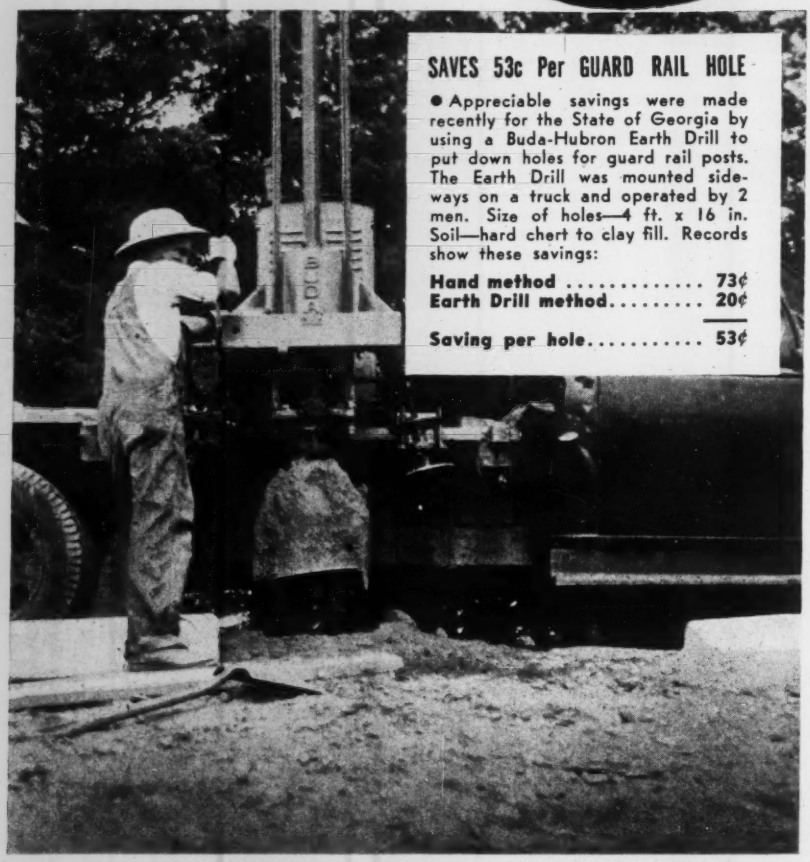

SAVES 53c Per GUARD RAIL HOLE

● Appreciable savings were made recently for the State of Georgia by using a Buda-Hubron Earth Drill to put down holes for guard rail posts. The Earth Drill was mounted sideways on a truck and operated by 2 men. Size of holes—4 ft. x 16 in. Soil—hard chert to clay fill. Records show these savings:

Hand method	**73¢**
Earth Drill method	**20¢**
Saving per hole	**53¢**

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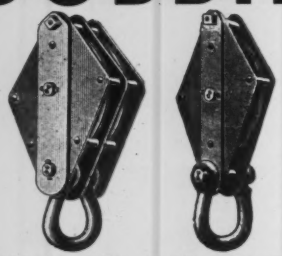

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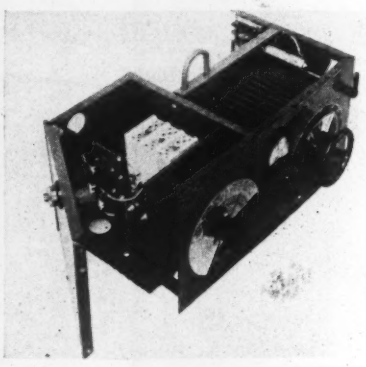
Whiteprint Machine

A new Model "C" Whiteprint machine has recently been placed on the market in the medium priced, easy-to-operate class, that will produce prints at speeds up to 12½ ft. per min. Synchronized to print and develop Ozalid sensitized materials in one continuous operation, it will use cut sheets or continuous yardage, and accommodate materials up to 42 in. wide. An automatic device separates the sensitized material from the original.—*Ozalid Products Div., General Aniline & Film Corp., Johnson City, N. Y.*

Paving Breaker

I-R has announced a new 60-lb. class "cushioned-air" paving breaker known as the CC-60. This tool is ideal for hard clay, shale, brick, concrete, or for jobs where it is not feasible to use a heavier tool. The ease in handling this tool comes from an air cushion which absorbs the blow of the piston when the steel is not in contact with the work, causing less fatigue for the operator and less breakage of parts. Form 2768 gives full details. —*Ingersoll-Rand Co., 11 Broadway, New York City.*



Arc Welder Control

Further improvement in Dual Continuous Control for arc welding machines has been announced by Lincoln Electric.

CLOW-NATIONAL
Super-deLavaud Cast Iron Pipe

Yarning the Joint

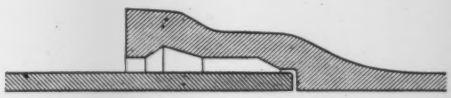
Pouring the Joint

Calking the Joint

CLOW-NATIONAL Super-deLavaud cast iron pipe is centrifugally cast in water-cooled steel molds WITHOUT CHILL. It is a superior pipe with a dense close-grained metal structure free from blow-holes, sand or slag inclusions. The pipe wall is of uniform thickness from end to end, and inside and outside diameters are true circles—absolutely concentric. Super-deLavaud pipe is a tough pipe with unusually high tensile strength combined with great ductility. It is highly resistant to shock, and its physical properties meet the requirements of Federal Specifications WW-P-421 for Type "I" cast iron water pipe.

The deLavaud pipe casting machines, in which Clow-National pipe in sizes through 24-inch are made, exercise positive control over the outside diameter of the pipe, while the pipe wall thickness and inside diameter can be readily varied to meet any specification. Super-deLavaud cast iron pipe can be cut easily with sledge and chisel, and drilling and tapping it for branch lines results in superior threads and perfect connections.

Available with ten individual types of joint, Super-deLavaud cast iron pipe can be furnished to meet the specific needs of any pipe line job.



Standard Water Bell

A self-centering shoulder in base of bell eliminates wedging and keeps each pipe in good alignment with all others in the line. This means faster and better calking, a saving of joint materials, and a better joint.

Super-deLavaud cast iron pipe with *standard water bells* is available in sizes from 3 to 24 inches inclusive, for all pressures, and in both 12 and 18-foot lengths. Price and delivery schedule upon request.

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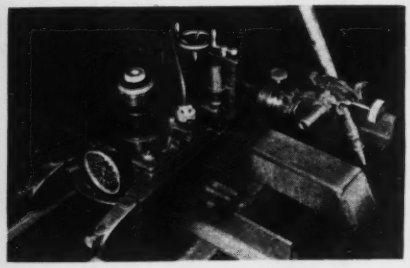
This improvement is in the form of a new welder control box of advance design and construction which prevents accidental contact with live parts, increases accessibility, permits wiring with flexible or rigid conduit, and eliminates dangers. An important feature of the "Type G" control box is the improved design and construction of the lifting hook which eliminates all risk of the hook being unscrewed unintentionally and becoming a hazard.—*Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio.*

Heavy-Duty Oil

A new oil for heavy-duty service in trucks, buses, tractors and other motorized equipment, both gasoline and diesel engine-powered, has been announced by Quaker State. This new product, marketed under the name "Quaker State HD Oil," is an alloyed oil, possessing greater strength and stability just as alloyed metals are stronger and more durable than ordinary metals. Starting with 100 percent pure Pennsylvania crude, alloy ingredients are added, one type to prevent oxidation, another to act as a detergent to prevent residues sticking to engine surfaces. An eight-page illustrated booklet tells the whole story.—*Quaker State Oil Refining Corp., Oil City, Pa.*

Arc Welding Improvement

The "Stroco" Crater Eliminator is an auxiliary device which is mounted on the body of an arc welding generator for use where the presence of the typical crater at the end of a weld deposit is objectionable. When introduced into the circuit its functions as a variable resistance to build up resistance in the excitation field, thus lowering the excitation field, thereby making it possible to reduce the current density gradually without disturbing the current setting of the welding generator. It is thus possible to accomplish the tapering off or a fading of the current instead of an abrupt change, the weld deposit made under these conditions being free from porosity at the end.—*Wilson Welder & Metals Co., 60 East 42d St., New York City.*



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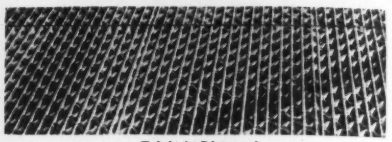

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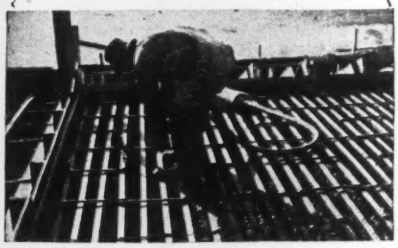

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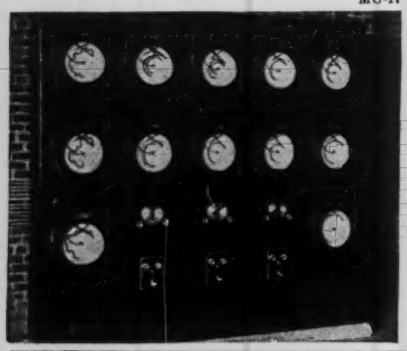

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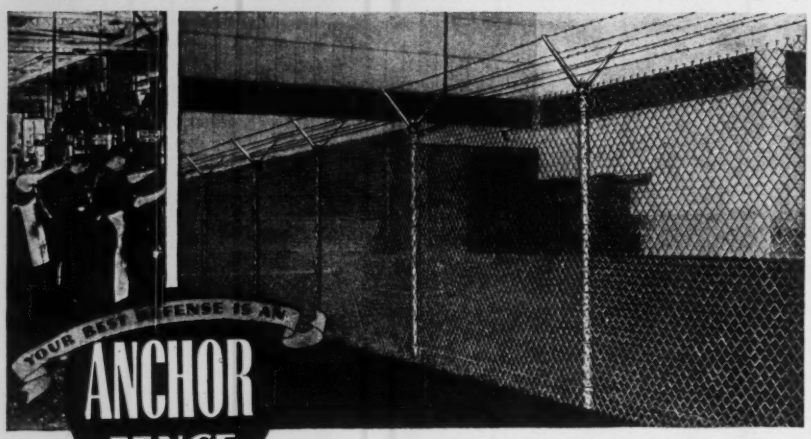

On Government Defense Work

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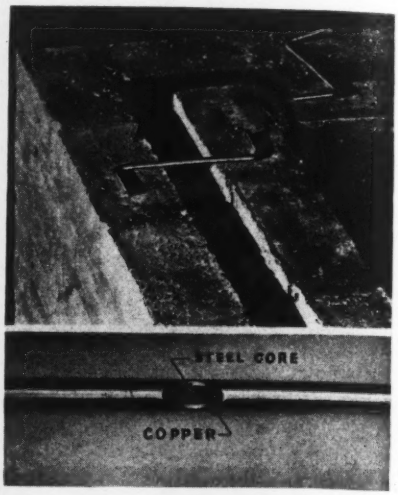
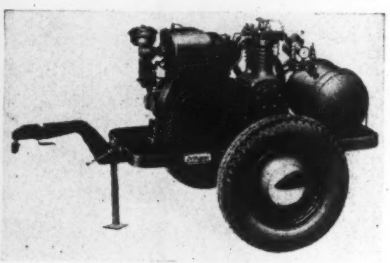
ble by a new Protractor type of torch holder. The new holder has a 90-degree angle range and can be attached to any standard Airco Radiagraph.—*Air Reduction, 60 East 42nd St., New York City.*



Ties for Cavity Brick Walls

Now available as a standard item is a high strength, non-rusting wall tie for cavity brick walls. It is made of .204-in. diam. high strength Copperweld wire having a minimum breaking strength of 3,934 lb. Standard Copperweld ties for 10-in. cavity brick walls are 6 in. long overall, with either 3-in. or 1¾-in. opposite right-angled anchor legs. Copperweld wire used in the production of these ties is a wire having a steel core protected against corrosion by a thick welded-on covering of pure copper.—*Copperweld Steel Co., Glassport, Pa.*



Spray Painting

Two improved series of 4- and 6-hp. portable spray painting air compressor outfits are now available for use in industrial and maintenance work, highway departments, public works, etc. Twenty assemblies are included in the two series —skid-mounted outfits, rubber-tired steel wheeled trucks, and two-wheeled trailers. Spray painting equipment for use with the outfit has been set up to be purchased separately from the air compressing machine.—*The DeVilbiss Co., Toledo, Ohio.*

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. . . SAID ALL 3 SUPERINTENDENTS

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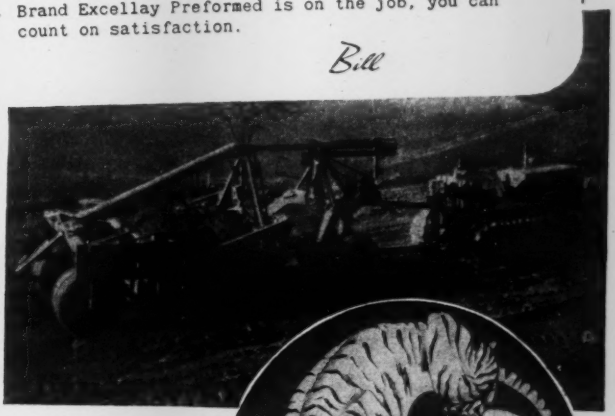
And it's the same story all over -- when Tiger Brand Excellay Preformed is on the job, you can count on satisfaction.

Bill



A BIG part of *satisfactory wire rope service* comes from selecting the *right wire rope* in the first place. And Tiger Brand Wire Rope owes many of its outstanding service records on tough jobs to the fact that one of our engineers made the initial recommendations to the user.

These experienced men know wire rope like you know your own business. They live and breathe wire rope problems. They spend practically all of their time right out where users are putting wire rope through the paces. They see it working under every kind of condition. They know how much abuse it has to take, and how to stretch your wire rope dollar under conditions of hard usage.

These American Tiger Brand Wire Rope engineers are out in the field for just one purpose—to help you lengthen the life and service of the wire rope you use. Call one of them in on your next problem—he'll gladly cooperate with you.

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Tournapull—Catalog TP-104 contains 12 colorful pages of valuable information, facts and illustrations on the Tournapull, Models C and Super C. This booklet answers questions and gives condensed specifications on both models. Tournapull Application Folder TR-102 shows the application of Tournapulls on all forms of earth-moving and construction in eight pages packed full of actual job photos.—*R. G. Le Tourneau, Inc., Peoria, Ill.*

Chemical Feeders—Details of electrical controls for proportional chemical feeders are described in Publication No. 3015 just issued by Cochrane. This device was developed particularly for proportioning a number of individual chemicals to water-conditioning systems in accordance with makeup requirements. —*Cochrane Corp., 17th St. and Allegheny Ave., Philadelphia, Pa.*

Nuts—A folder describes the Elastic Stop Self-Locking Nuts, with an interesting explanation of how they work, and why.—*Elastic Stop Nut Corp., 2330 Vauxhall Road, Union, N. J.*

Safety Shoes—The new 1942 catalog of Lehigh Safety Shoes includes the famous Lehigh "Safety Shoe Buyers' Guide," giving complete information on what to specify in buying safety shoes. The catalog shows 43 types of safety shoes with special constructions for various conditions.—*Lehigh Safety Shoe Co., Allentown, Pa.*

Steel Flooring—The Open Steel Flooring Institute's booklet, "New Ideas in Functional Floor Design," has just come off the press. This is a handbook for architects and engineers on the uses and properties of open steel grates for floors, stair treads, walkways, ventilators, sidewalk grating and platform construction.—*The Open Steel Flooring Institute, Inc., Dept. B, American Bank Building, Pittsburgh, Pa.*

Bulletin Boards—Streamlined bulletin boards is the subject of a 2-page catalog folder which describes bulletin boards for wall mounting of safety signs.—*The Boyer Campbell Co., 6540 Antoine St., Detroit, Mich.*

Tractors—"Licking the Oilfields' Toughest Jobs" is the title of a colorful booklet emphasizing the two-fisted power required in oil field work and picturing many operations in which Caterpillar diesel tractors, diesel engines and diesel-electric sets are used. Ask for Form 6907.—*Caterpillar Tractor Co., Peoria, Ill.*

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...it's Hot Dip Galvanized

17 years in service then through 12 one-minute immersions in the Preece Test

● Yes, these gratings after 17 years in rain and snow stood up under a test that says, "they're as good as new" (from the standpoint of rust protection) . . . but *these* gratings were hot dip galvanized and *Hot Dip* Galvanizing is different—much longer lived. It gives *you* the greatest rust protection per dollar known to modern science. It *fuses* an extremely *thick* coating of zinc right into the steel and makes it an *inseparable* part of the product . . . You pay for this protection whether you get it or not. Be sure you get it. Patronize members of this Association and *know* that every job is a *top quality*, genuine Hot Dip job . . . Write for literature and learn the facts. Address American Hot Dip Galvanizers Association, Inc., American Bank Building, Pittsburgh, Penna.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

Acme Galvanizing, Inc., Milwaukee, Wis. ★ Acme Steel & Malleable Iron Works, Buffalo, N.Y. ★ American Tinning & Galvanizing Co., Erie, Pa. ★ Atlantic Stamping Co., Rochester, N.Y. ★ Atlantic Steel Co., Atlanta, Ga. ★ Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N.Y. ★ Diamond Expansion Bolt Co., Inc., Garwood, N.J. ★ Equipment Steel Products Division of Union Asbestos and Rubber Co., Blue Island, Ill. ★ The Fanner Mfg. Co., Cleveland, O. ★ John Finn Metal Works, San Francisco, Cal. ★ Galvanizers Incorporated, Portland, Oregon ★ Thomas Gregory Galvanizing Works, Maspeth, N.Y. ★ Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa. ★ James Hill Mfg. Co., Providence, R.I. ★ Hubbard & Co., Oakland, Cal. ★ Independent Galvanizing Co., Newark, N.J. ★ International-Stacey Corp., Columbus, O. ★ Isaacson Iron Works, Seattle, Wash. ★ Joslyn Co. of California, Los Angeles, Cal. ★ Joslyn Mfg. & Supply Co., Chicago, Ill. ★ L. O. Koven & Brother, Inc., Jersey City, N. J. ★ Lehigh Structural Steel Co., Allentown, Pa. ★ Lewis Bolt & Nut Co., Minneapolis, Minn. ★ Missouri Rolling Mill Corp., St. Louis, Mo. ★ The National Telephone Supply Co., Cleveland, O. ★ Penn Galvanizing Co., Philadelphia, Pa. ★ Riverside Foundry & Galvanizing Co., Kalamazoo, Mich. ★ San Francisco Galvanizing Works, San Francisco, Cal. ★ The Sanitary Tinning Co., Cleveland, O. ★ Standard Galvanizing Co., Chicago, Ill. ★ Wilcox, Crittenden & Company, Inc., Middletown, Conn. ★ The Witt Cornice Company, Cincinnati, O.

OFFICIAL • INSIGNIA

PROTECTED BY GENUINE HOT-DIP GALVANIZING

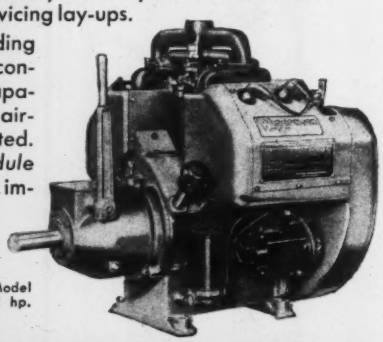
AMERICAN HOT DIP GALVANIZERS ASSOCIATION INC.

FROM OUR FILES—CASE NO. 4202—Gratings, Hot Dip Galvanized in 1923 by Standard Galvanizing Co., Chicago and tested by Robert W. Hunt Co. in 1941.

Work Schedules Handled *On Schedule*

During these days of high pressure production, owners of Wisconsin-powered equipment are definitely fortunate. Here is HEAVY-DUTY POWER (regardless of engine size) that stays on the job until it's done... ready to start on the next job without servicing lay-ups.

Efficiency-minded operators are finding many new applications for their Wisconsin-powered equipment. The work-capacity of these compact, light-weight, air-cooled engines is practically unlimited. Work schedules are handled *on schedule* wherever power dependability is an important factor.



Illustrated is the Model VE-4 4-cylinder, 22 hp. engine.

MOST POWER PER POUND
HEAVY-DUTY AIR-COOLED ENGINES

by WISCONSIN MOTOR CORPORATION
Milwaukee, Wisconsin, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

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WITHOUT CHARGE

Send us your name, title, name of company and address. We'll mail you each issue of this informative periodical (not advertising). "Rope Dope" keeps you up with the times in the wire rope field. There is no obligation on your part. D

UNION WIRE ROPE CORPORATION
2134 Manchester Ave. Kansas City, Mo.
Tulsa • Houston • Chicago • Salt Lake City
New Orleans • Monahans • Portland • Ashland, Ky.

UNION *Wire Ropes*

The "ULTIMATE LOW COST WIRE ROPE"

Wire Rope—A wire rope catalog-hand-book just issued by Macwhyte is sectionalized for quick reference with a tabbed index and table of contents for each section. Sixty pages of general information have been added to make this a 170 page handbook giving full information on wire rope.—*Macwhyte Co., Kenosha, Wis.*

Clamps—Knu-Vise toggle action clamping fixtures is the subject of a 24-page catalog featuring 22 different models of clamps, pliers, plier-parallels, "C" clamps, etc.—*Knu-Vise, Inc., 16841 Hamilton Ave., Detroit, Mich.*

Ditch Excavator—A mailing piece describes the Bucyrus-Ruth excavator specially built for ditch maintenance and construction. The folder features cleaning out weed-choked ditches to restore full value of the water passages.—*Bucyrus-Erie Co., South Milwaukee, Wis.*

Electric Tools—An 8-page folder describes Wodack portable electric drills, hammers, sanders and brinders, and other tools.—*Wodack Electric Tool Corp., 4627 W. Huron St., Chicago, Ill.*

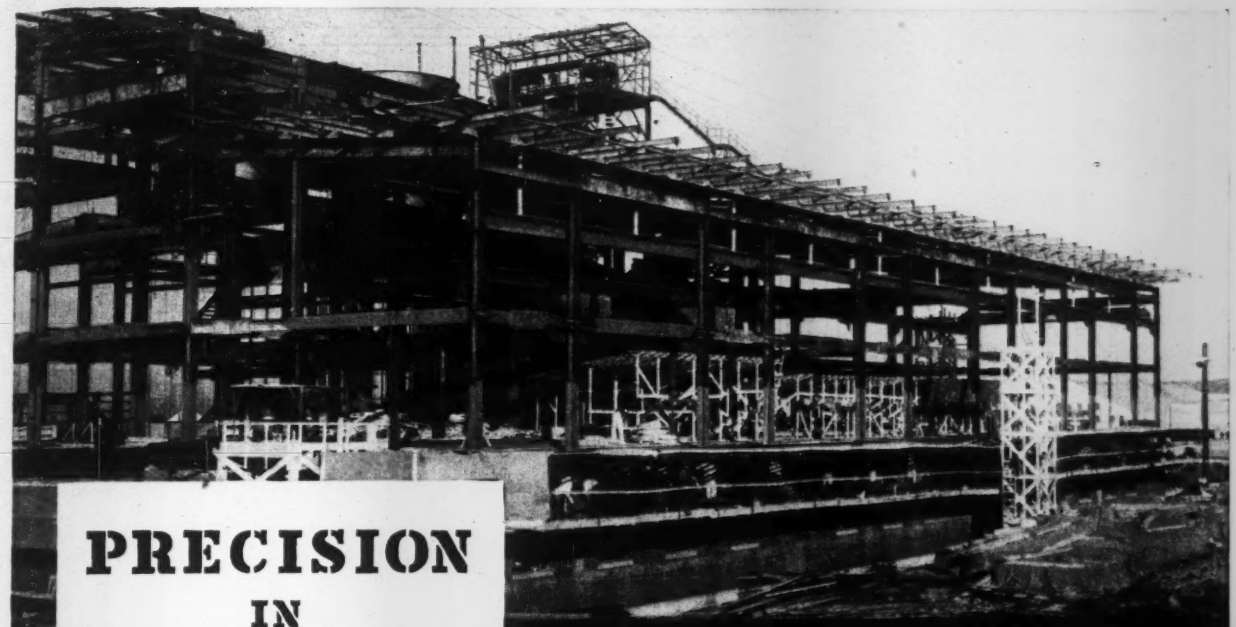
Compressor—The heavy-duty, horizontal single-stage compressors available in sizes from 5 to 125 hp. and for pressures up to 150 lb. are fully illustrated and described in a two-color 16-page bulletin.—*Pennsylvania Pump & Compressor Co., Easton, Pa.*

Flexible Shaft Machines—A new 8-page brochure describes the various flexible shaft machines for use in grinding, polishing, burring and for other operations necessary in industry and construction.—*Walker-Turner Co., Inc., Plainfield, N. J.*

Traxcavators—Thirty-seven field photos of Traxcavators in action are offered in a new catalog to prove that a Traxcavator is more than a machine—it is a modern dirt-and-material handling "Method." Pictures show that these rugged tractor-shovels are highly mobile, that they will dig the toughest soil and will also carry their loads to the hauling units or to point of discharge.—*Trackson Co., 3343 S. Chase Ave., Milwaukee, Wis.*

Vibration Control—A four page bulletin describes the isolation of drop hammers by applying steel spring Vibro-Isolators to the concrete foundation.—*Korfund Co. Inc., Long Island City, N. Y.*

Hydraulic Drives—A pictorial 24-page booklet describes Twin-Disc hydraulic clutch and hydraulic torque converters



PRECISION IN STEELWORK

Power House built for Hercules Powder Company at Radford Ordnance Works, Pepper, Va.

AS the nation's largest independent fabricator of structural steel and plate work, Ingalls supplies a complete and outstanding service for all types of building.

Our Birmingham and Pittsburgh shops are strategically located at the back doors of the rolling mills, thus averting transportation delays. At Pascagoula, Mississippi, our shipyard is the *only* major plant in the country built *exclusively* for the construction of all-welded ocean vessels: urgently needed ships of less weight, greater strength, higher speed and larger cargo capacity. Another modern Ingalls shipyard, at Decatur, Alabama, is turning out smaller, but equally important, equipment for the Inland Waterways.

Whatever the job, Ingalls delivery is always prompt, precise and geared to present demands.

THE INGALLS IRON WORKS COMPANY

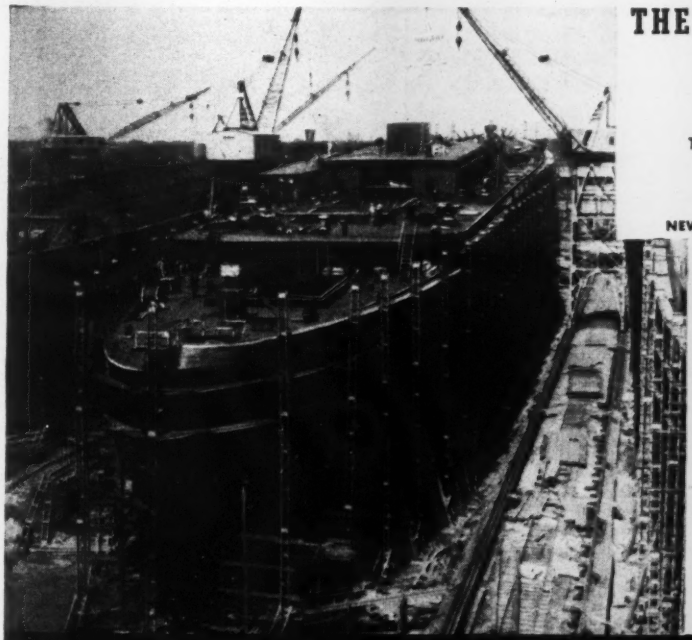
BIRMINGHAM, ALA.

Subsidiary Companies and Divisions

THE STEEL CONSTRUCTION COMPANY
THE INGALLS SHIPBUILDING CORPORATION
BIRMINGHAM TANK COMPANY

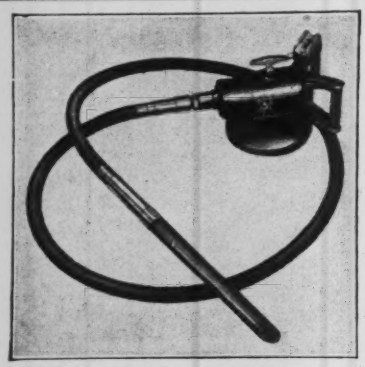
Branch Offices

NEW YORK · PITTSBURGH · ATLANTA · NEW ORLEANS



S. S. AFRICAN METEOR, all-welded cargo-passenger vessel for American South African Line, Inc., nears completion at Pascagoula shipyard

60,000-gallon tower tank with 65-foot tower Built for Armstrong Tire & Rubber Company, Natchez, Mississippi



MASTER 2C ELECTRIC-CONCRETE VIBRATOR

Speeds of 4500; 5500; 7200 R.P.M.
ALL Speeds rated at *FULL LOAD.*
Low Maintenance. Ruggedly Built.

Master Electric-Concrete Vibrators are available in sizes, ½ HP to 3 HP, any standard voltage, either AC or DC current. Electric power not being available, Master Gas-Electric Portable Generator Plant will solve your power problem.

MANUFACTURERS OF

- Gas-Electric Generator Plans, 500 Watts to 240 KVA—AC or DC.
- "Big 3" Gas-Electric Power Units for Electric Generation, Concrete Vibration & Tool Operation.
- Concrete Vibrators-Gas or Electric.
- Concrete Surfacing Attachments.
- Master Power Blow Hammers & Tools.
- Complete Line of High Speed Tools.

Master Distributors throughout United States and Canada. All Foreign territories—Armco International Corporation.

Send for #16 Equipment Manual today.

Master Vibrator Co., Dayton, Ohio

CONCRETE PIPE

FOR ALL DRAINAGE AND WATER SUPPLY PURPOSES

Either shipped to you from one of our permanent plants, or manufactured for you on the job by one of our mobile units.

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CONCRETE PIPE EQUIPMENT

FOR SALE OR LEASE

Enables engineers and contractors to manufacture pipe at distant or foreign job sites.

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CONCRETE CRIBBING

UNIVERSAL CONCRETE PIPE COMPANY

Main Office
COLUMBUS, OHIO

Plants can conveniently serve projects in: Massachusetts—Connecticut—New York—New Jersey—Pennsylvania—Ohio—West Virginia—Georgia—Florida—Michigan—Indiana—Illinois—Tennessee—Kentucky—North Carolina—South Carolina.

and describes some of the many and varied services to which they have been applied with consistently outstanding results. The differences between the clutch and the torque converter and the advantages of each, are carefully outlined.—*Twin Disc Clutch Co., Racine, Wis.*

Air Conditioning—"Heat Disposal" is the title of a 12-page booklet which outlines the theory, operation and principal features of the complete line of Carrier Evaporative Condensers.—*Carrier Corp., Syracuse, N. Y.*

Metal Lath—A new booklet describes standard metal lath and features its reinforcing, fire and earthquake protection qualities as well as other structural properties.—*Metal Lath Manufacturers Association, LaSalle St., Chicago.*

Magnetic Pulleys—A 16-page reference catalog describes magnetic pulleys and magnetic pulley separator units and gives specifications and application data.—*Stearns Magnetic Mfg. Co., Milwaukee, Wis.*

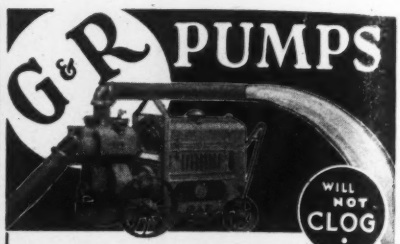
Dust Collectors—Unit type dust collectors are the subject of Bulletin 907. These devices are shipped completely assembled ready for attachment to individual machines of any type that create dust.—*Pangborn Corp., Hagerstown, Md.*

Wire Rope—A new booklet "Industrial Wire Rope" is just available which covers wire rope of all grades and constructions for industrial purposes. The booklet contains specific recommendations as to the construction best suited for various types of cranes and industrial machines.—*Broderick & Bascom Rope Co., St. Louis, Mo.*

Flow Meters—Originating as a flow-meter catalog describing the Cochrane line of flow-meters, "Flow-Meters by Cochrane" has grown to a 52-page handbook of instrument application to steam, water, air, gas and viscous, volatile and corrosive fluid measurement. Special sections are devoted to control applications and a list of available charts is included as a guide to meter users.—*Cochrane Corp., Philadelphia, Pa.*

Valves—A catalog has just been issued on "Diaphragm Type" valves which illustrates and explains how the working parts are isolated from the thru-put avoiding corrosion troubles. A complete list of service recommendations is included.—*Hills-McCanna Co., 3025 N. Western Ave., Chicago, Ill.*

Gasoline Storage—A folder describes the Aqua flotation system for storage of volatile aviation fuels.—*Aqua Systems, Inc., Neptune Meter Co., 385 Gerard Ave., New York City.*



The most DEPENDABLE Pump for the Least Money

Claims of fastest priming, highest suction lift, more gallons per minute, etc., do not pump water. On the job, the pump must do its own talking, and with dirty water, many a pump is inclined to stutter—and stop.

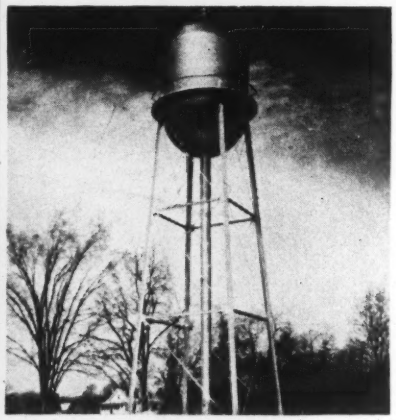
Let G & R Pumps tell you their own story on any job. They will deliver as much, and usually more, water under any condition, than any other pump. We will ship you one and let you be the judge.

Remember this about G & R Pumps —THEY WILL NOT CLOG—THEY ASK NO TIME OUT. Play safe! That is why more contractors are standardizing on G & R Pumps than on any other make.

Distributors in 100 principal cities are ready to make prompt delivery of the G & R Pumps you need.

THE GORMAN-RUPP CO. Mansfield, Ohio

ELEVATED TANKS



• 100,000 Gallon Elevated Water Storage Tank on 75' Tower—Upper Marlboro, Maryland

Designed for quality, safety and economy either to Customer's specifications or our standard tank.

Consult Lancaster's specialized engineering service when you have a problem in tanks. Complete information will be furnished promptly with no obligation to you. Write, telephone or wire today.

LANCASTER IRON WORKS, INC.
Lancaster, Pa.

IT IS SEPTEMBER 9, 1891...

It is twilight, on an evening fifty years ago, in a young and bustling Milwaukee. Horse cars rattle through the streets, 5c beer signs swing quietly in the lake breeze. Tall-masted, broad-waisted schooners crowd the busy water front . . . And here, in this gas-lighted office, an infant industry is taking its first confident steps, as three farseeing men hold the first directors meeting of the newly-formed Chain Belt Company of Milwaukee.

THESE men had in common the belief that there was a definite need in industry for lower cost, more efficient means of transmitting power and moving materials. With a line of unique "chain belts," they purposed to fill this need.

Were they right? Did they succeed? The answer is found throughout industry as well as in some of the greatest engineering projects of our time.

Boulder Dam—Golden Gate Bridge—Delaware Aqueduct—Philadelphia and Brooklyn dry docks—these and numerous other impressive structures have been or are being built with the aid of Rex Pumpcretes, Rex Moto-Mixers, Pavers and Rex Mixers and Pumps. For, though organized to produce chain belts, the company has long since expanded its lines and has become a leader in the construction equipment field.

Since that evening, fifty years ago, Chain Belt Company has never turned from the task of helping industry find the answer to *"how to handle it."* In doing so it has matched, stride for stride, the spectacular progress of American industry. Today, Rex construction equipment is but a part of the Rex line which includes over 2,000 sizes and types of chain belts as well as numerous conveyor and engineering products.

* * *

Rex Construction Machinery Division, Milwaukee, Wisconsin. Baldwin-Duckworth Roller Chain Belt Division, Springfield and Worcester, Mass.; Rex Chain Belt and Transmission Division, Rex Conveying and Engineering Products Division.

50TH ANNIVERSARY 1891 REX 1941 CHAIN BELT COMPANY

CHAIN BELT CO.
OF MILWAUKEE

"For it's always Fair Weather"... when Water Works men and SMITH EQUIPMENT get together!

But there's more than jollity to the Water Works get-together today. Defense needs must be considered. Water supply must be adequate. Good equipment — dependable valves and hydrants—are of paramount importance. This is no time for experiments. Select equipment that has been proved by years of service—SMITH.

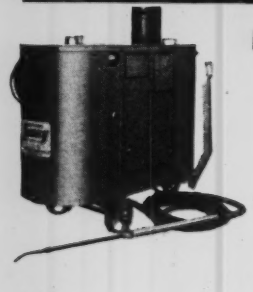
P.S. Have you all the latest Smith printed matter?

THE A. P. SMITH MFG. CO.
EAST ORANGE, N. J.

7 So. Dearborn St., Chicago, Ill.
1530 Upson Avenue, El Paso, Texas
315 N. Crescent St., Flandreau, S. D.
901 Wm. Oliver Bldg., Atlanta, Ga.
59 Oak Vale Ave., Berkeley, Calif.
524½ First Ave. S., Seattle, Wash.

SAVE UP TO 40¢ OUT OF EVERY REPAIR DOLLAR

Where mechanics work on dirty, greasy tractors, trucks, rollers, graders, shovels, etc., Hypressure Jenny Steam Cleaning before repair saves up to 40 cents out of every dollar of labor cost. Hypressure Jenny speeds the annual overhauling of equipment. Its thorough cleaning prepares surfaces for repainting; and discloses cracked or worn parts for repair before breakdowns occur. Find out how much Hypressure Jenny can save YOU. Send for free survey.



HOMESTEAD VALVE MFG. CO.
P. O. Box 31, Coraopolis, Pa.

MAIL COUPON TODAY

Tell us how, an how much JENNY can save us.

We have.....men employed on equipment maintenance.

We repair.....pieces of equipment monthly.

We want to clean .....

Name .....

Address .....

Manufacturers' Activities

BAILEY METER CO., Cleveland, Ohio, has announced the opening of a Detroit branch office July 1. Although the company has been previously represented in Detroit by resident engineers the increased demand for sales and engineering service in connection with power and process measurement and control has necessitated the opening of a formal office, which will be under the management of N. M. BARNETT.

K. P. CROWELL, factory training manager of Caterpillar Tractor Co., Peoria, Ill., has been appointed to a position in the OPM's Training Within Industry branch.

B. F. GOODRICH CO., Akron, Ohio, has registered the name "Transcord" with the U. S. Patent Office, and will use the name as a brand to denote use of the company's transverse cord breaker in either cord conveyor or fabric conveyor belting.

Chain Belt 50 Years Old

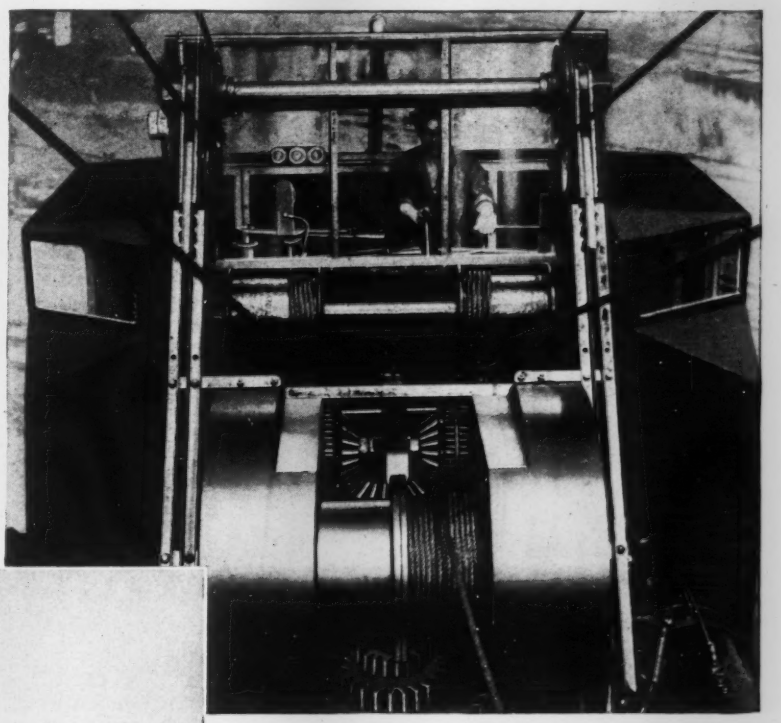
On Sept. 9 the Chain Belt Co. of Milwaukee celebrated its fiftieth anniversary looking back on an enviable record of progress and achievement. Started in 1891 for the purpose of producing an improved type of detachable chain, then used largely on agricultural machinery, it has since expanded its activities and is today recognized as one of the largest and best-known producers of chain belts, construction machinery, elevating and conveying equipment and other related products. About 1900, the company developed a limited line of elevators and conveyors for use in manufacturing processes and in 1902 erected and occupied the first of its own buildings. In 1908 the company built its first concrete mixer and since that time has been closely identified with the construction industry. Road pavers, equipped with steam power, were added in 1912, to be followed by centrifugal water pumps, plaster and mortar mixers, Moto-Mixers and the REX Pumpcrete. In 1930 the company embarked on the manufacture of sewage disposal and water treatment equipment, the line now including such things as sludge collectors of both the conveyor and Two-Bro type, mechanically cleaned bar screens, grit collectors and washers, flocculators, water filtering systems and screening shredders. The company now has branch offices in practically all of the important cities in this country and distributors in all important countries abroad. J. C. Merwin, who joined the Chain Belt organization in 1917 as superintendent, is president.

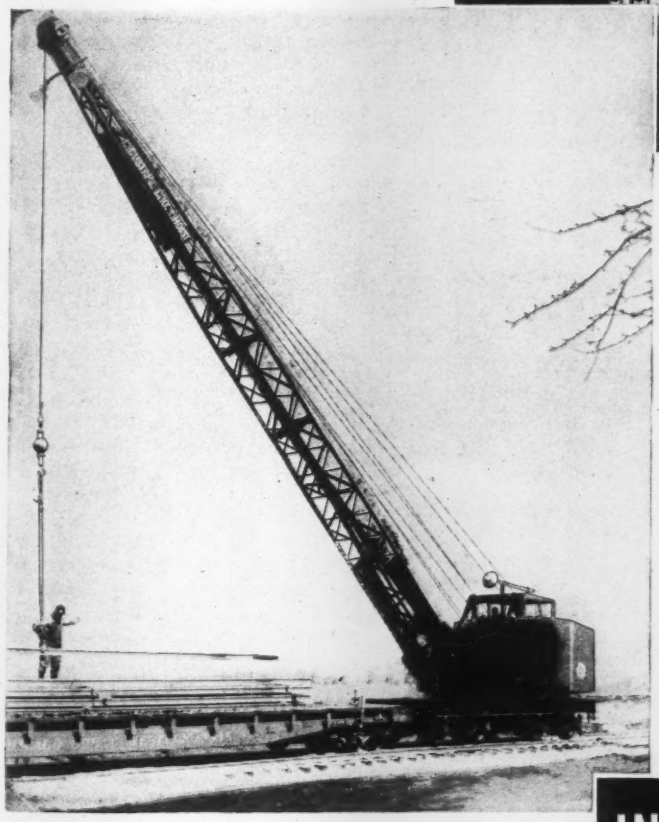
(*Continued on p.* 164)

360° CLEAR VISION...

MONITOR-TYPE CAB PROVIDES VISION FROM BOOM TIP TO ROPE DRUMS

Surrounded by glass windows an operator in the new, patented, Industrial Brownhoist Monitor-type cab has perfect vision to front, back and both sides. He can clearly see what he is doing at all times whether it be lifting materials or switching freight cars. In addition to 360° visibility, ventilation is far better than in ordinary cabs and motor noise and heat are greatly reduced.





And yet the new Monitor-type cab is only one of the many advantages you get in an Industrial Brownhoist gasoline or Diesel locomotive crane. Booms are constructed for maximum strength with a minimum of weight. Power plants develop more power and use less fuel than ever before. Under carriages are built to the same standards as the heaviest railroad tenders. In fact, from every standpoint, the Industrial Brownhoist cranes of today are designed and built to insure longer crane life, lower operating costs and greater operator efficiency. Write today for further facts.

BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK
PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO

INDUSTRIAL BROWNHOIST
BUILDS BETTER CRANES

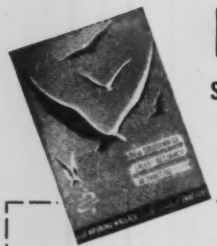
"IT ADDS AN *EXTRA Draftsman* FOR EACH 10 WE EMPLOY!"

DRAFTSMEN SCARCE? Work rush? You can solve this problem by increasing the *drafting effectiveness* of your present men with Bruning-Wallace Touch-Control drafting machines.

Bruning-Wallace Touch Control Drafters save from 25% to 40% of drafting time, actual surveys have proved. But if these modern drafters saved only 10%, it would be like adding one extra draftsman for every 10 draftsmen you employ!

What's more, Bruning-Wallace Touch Control Drafters, with their precision machining and careful workmanship, result in *increased accuracy*. No wonder they help to cut your engineering and production costs!

A free, illustrated booklet, giving complete information, is yours for the asking—just mail the coupon—there's no obligation.



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CHARLES BRUNING CO., *Inc.*
New York: 100 Reade Street
Chicago: 4700 West Montrose Ave.
Los Angeles: 919 So. Maple Avenue
Please send me free booklet on the Bruning-Wallace Touch Control Drafters.

Name .....
Company .....
Address .....
City ..... *State* .....

(*Continued from p.* 162)

THE BUCKEYE TRACTION DITCHER CO., Findlay, Ohio, has announced the appointment of the following dealers to handle Buckeye Unitilt bulldozers and Trail-builders, Buckeye rigid type bulldozers and Buckeye power control units for Allis-Chalmers tractors: the Southern Ohio Equipment Co., Zanesville, Ohio, and the Lakeshore Machinery & Supply Co., Muskegon, Mich.

W. BUSH HERBERT, 63, native of Nashville and president of T. L. Herbert & Sons, died recently.

A. C. BERG has been placed in charge of manufacturing for the Road Machinery Division of Gar Wood Industries, Inc. of Detroit. Mr. Berg has been in the employ of Gar Wood Industries, Inc. since 1919.

T. F. HALPIN, secretary and sales manager of the A. P. Smith Manufacturing Co., East Orange, N. J., died August 29.

MEEHANITE METAL CORP., Pittsburgh, has announced that manufacturing rights for Meehanite castings have been granted to Cooper Engineering Ltd., Bombay, India, and the Globe Engineering Works, Capetown, South Africa. The Indian company is a large manufacturer of agricultural implements and general machinery; the African company produces mining equipment and other machinery.

SAFWAY STEEL SCAFFOLDS CO., Milwaukee, has announced the election of B. D. CHRISTIAN as president. For the past year Mr. Christian has been vice president and general manager of the company, and was formerly vice president of the Crocker Wheeler Electric Manufacturing Co. of Ampere, N. J.

L. W. WALLACE, research and management engineer, has joined the staff of The Trundle Engineering Co., of Cleveland, as vice president. Previously Mr. Wallace was director of engineering and research of the Crane Co., Chicago.

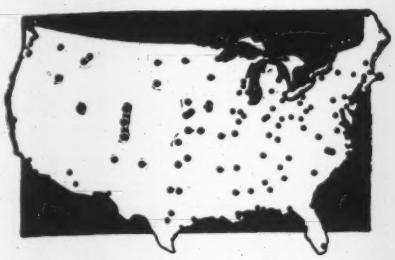
COL. W. F. ROCKWELL, president of the Pittsburgh Equitable Meter Co. and the Merco Nordstrom Valve Co., Pittsburgh, has been appointed a national councillor of the Chamber of Commerce of the United States to represent the Association of Gas Appliance and Equipment Manufacturers.

CARNEGIE-ILLINOIS STEEL CORP., Pittsburgh, has announced the appointment of CHARLES E. MCINTYRE as assistant manager of sales at Detroit, Mich., to succeed L. B. WORTHINGTON, who was recently named manager of sales, bar, strip and semi-finished materials division of the company.

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply — Unclassified
Sewers, Waste Disposal — Latin America
Bridges, Grade Cross'gs — Public Buildings
Streets & Roads — Commercial Buildings
Earthwork, Waterways — Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

†Ala., Childersburg—Town, imprv. WW and sewerage sys., Docket Ala. 1-102. $240,000. **FWA.**

★**Ala., Mobile**—Filtration plant $746,000, reservoir repairs $190,000, distr. sys. addn. $878,000, additional supply bldgs. $770,000. Converse & Co., Wilson Bldg., engrs.

Calif., Arcadia—1 m.g. water supply reservoir, Sierra Madre, near Grand View Ave. and Santa Anita Aves. Over $15,000. G. B. Watson, City Hall, engr.

Calif., San Francisco—City and County of San Francisco, completing plans watermains, vitr. sewers, portions Sunnydale Ave. $21,450. J. J. Casey, city engr.

★**†Calif., Vallejo**—City, WW addns., imprvs., Docket Calif. 4-126. $908,400. **FWA.**

Ill., Christopher—L. Hileman, mayor, 6 mi. pipe line to Big Muddy River as an emergency source supply. $30,000.

Ill., Decatur—Exten. boiler room, installing new boiler, stokers, etc., WW. $110,000. Warren & Van Praag, Decatur, engr.

Ill., Galesburg—Concrete wall for dividing present reservoir into 2 units, installing automatic chlorinator, $110,000. Tentative plans approved by State. Stanley Eng. Co., Muscatine, Ia., engr. CD 7/21—ENR 7/24.

Ill., St. Elmo—70 m. g. reservoir.

Ia., Charlton—J. R. Barnett, city supt., WW. imprvs. $100,000. Stanley Eng. Co., Muscatine, engr.

Minn., South St. Paul—E. L. Sloan, city recdr., 2 m.g. reservoir. Consoer, Townsend & Quinlan, 211 W. Wacker Dr., Chicago, Ill., engrs. CD 7/16—ENR 7/24.

Mo., Florissant—C. G. Peters, city clk., defeated bonds Aug. 23, water distr. sys. exten. $15,000. Plans new bond election. CD 8/11—ENR 8/14.

Neb., Papillion—WW imprvs., wells, pump. facilities, mains, $15,000. Henningson Eng. Co., Standard Oil Bldg., Omaha, engr.

†N. M., Gallup—Town, WW extens., imprvs., Docket N. M. 29-101. $15,000. **DPW.**

O., North Canton—G. W. Price, Mayor, imprv., enlarging WW sys. $20,000. L. L. Brancher, city clk.

O., Bettsville—C. S. Seiger, mayor, WW sys. $52,000.

O., Lockland—P. D. Morrow, mayor, WW sys. and treatment plant, etc. $400,000.

O., Medina—L. F. Garver, mayor, exten. WW sys. $65,000.

O., Painesville — Exten. watermains to Painesville-on-the-Lake and Sunset Point Dists. $42,000. K. G. Smith, city engr.

★**Okla., Tulsa**—W. F. McMurray, city supt., WW imprvs. $725,000. Applied for PWA allot.

†Pa., Borough Twp—Borough Twp., Beaver County, complete waterworks, Docket Pa. 36-101. $148,000. **DPW.** M. Baker, Jr., 122 Penn Beaver Hotel, Rochester, engr. Chester Engineers, 210 E. Parkway, N.S., Pittsburgh, consult. engrs.

★**†R. I., Newport** — Newport Waterworks 230,000 gal. storage reservoir, small pump. plant; 1 m.g. covered reservoir, purification plant with pump. station and 4 mi. watermains, Docket R.I. 37-101. $940,000. **DPW.**

†Tenn., Tullahoma—Town, water and sewerage sys. exten., Docket Tenn. 40-103. $664,000. **FWA.**

Tex., El Paso—El Paso County Water Control & Imprvt. Dist. 1, c/o M. Scarbrough, 405 Caples Bldg., fresh water supply. $495,000. Applied for DPW funds. Frazer & Benner, 705 El Paso Natl. Bank Bldg., engr.

Tex., Freeport—c/o W. Allen, WW exten., imprvs. $198,140. Applied for DPW funds. H. G. Olmsted, 3905 Galveston Rd., Houston, engr.

★**†Tex., Galveston**—City WW extens., impvs., Docket Tex. 41-133, $1,282,000. **DPW.** Bacon & Davis, Santa Fe Bldg., engrs.

Tex., Galveston—Galveston Co. Water Control & Imprvt. Dist. 3, c/o B. Inselman, Galveston, WW sys. Tex. 41-265. $140,000. Applied for DPW funds. J. Rady, c/o Majestic Bldg., Fort Worth, engr.

Tex., La Marque—Galveston Co. Water Control & Imprvt. Dist. 3, c/o B. Inselman, WW sys., well, pump. equip., tanks, watermains, etc. Tex. 41-265, $140,000. Applied for FWA funds. J. J. Rady, Majestic Bldg., Fort Worth, engr.

Tex., Palacios—City, WW imprvs., extens., Tex. 41-104. $130,236. **DPW.**

Tex., Pottsboro—W. H. Young, mayor, City Hall, WW., fire station, distr. sys. exten., etc. $51,000. Applied for DPW funds. J. J. Rady, Majestic Bldg., Fort Worth, and J. Montgomery, Littlefield Bldg., Austin, engrs.

Tex., Victoria—B. T. Jordan, mayor, WW imprvs. $39,184. Applied for DPW funds. E. F. Miles, Victoria, engr.

★**Utah, Ogden**—Developing new city culinary supply, providing addnl. distribution within city and to national defense projects within area surrounding city, $2,182,000. J. C. Brown, city engr. PWA gr. sought. CD 7/21—ENR 7/24.

★**†Va., Newport News**—City filter plant, pump. station, water-mains, equip., Docket Va. 44-115, $1,148,000. **DPW.**

Utah, Salt Lake City — W. D. Beers, city engr., 16 in. c.i. watermain to Small Arms Ammunition Plant, $135,000. War Dpt. Loan.

†Va., Portsmouth—City, WW sys. addn., Docket Va. 44-139. $500,000. **FWA.**

Wash., Seattle—Received no bids Aug. 28, 3,806 ft. 21 in. electric welded steel pipe for watermain replacement. Will readvertise.

Wash., Tacoma—Replacing 14,482 ft. Green River gravity pipeline from S. 64 to J St. standpipe. W. A. Kunigk, water supt. P. Utilities Comr. authorized to apply for PWA funds.

★**†T. H., Honolulu**—City and Honolulu Co. WW, Docket T. H. 51-101. $980,000. **FWA.**

B. C., Nanaimo—Repairing dam at South Fork. $20,000. A. G. Graham, Town Hall, engr.

Ont., Westboro—Nepean Twp., c/o A. E. Morris, clk., watermains, $15,000.

Que., Ancienne Lorette—Bids soon extend. municipal aqueduct. $40,000.

Que., Drummondville—c/o R. Heroux, municipality clk., watermains. $21,000. A. Roberge, Town Hall, engr. CD 8/14—ENR 8/21.

BIDS ASKED

Bids Asked September 16

Conn., Waterbury—Bd. P. Wks., City Hall, high service control station, chlorine and control bldg., water turbine pumps, 75 h.p. gasoline auxiliary engine.

†S. C., Moultrieville—Con. Q.M., elevated steel water tank, Fort Moultrie. CD 8/5—ENR 8/7.

Bids Asked September 17

N. Y., New York—Comr. Water Supply, Gas & Electricity, Municipal Bldg., hauling, laying watermains, grounds Clason Point houses, Story, Noble, Croes, Seward and Metcalf Aves., Bronx Boro.

Bids Asked September 18

Mass., Boston—Commonwealth of Massachusetts, Metropolitan Dist. Comn., Water Div., 20 Somerset St., 5,300 lin. ft. 24 in. steel water pipe, appurtenant connections, Contr. 138, Arlington. Over $100,000.

Bids Asked September 22

N. J., Moorestown—Moorestown Twp. Com., S. T. Hollinshead, twp. engr., construction, installation artesian well, pump. equipment, municipal waterworks; adv. ENR 9/11.

Bids Asked

†Tex., Waco—U. S. Eng., Santa Fe Ry. Bldg., Galveston, 300,000 gal. elevated steel water tank and tower. $60,000.

LOW BIDDERS

N. Y., New York—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., Sept. 2, pump house, etc. Far Rockaway, from National Excavation & Structures Corp., 10 E. 40 St., $178,000. CD 4/23—ENR 5/1.

†S. C., Charleston—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Sept. 5, 500,000 gal. elevated water storage tank, from R. G. Cole Mfg. Co., Newnan, Ga. **$53,200.** CD 9/3.

CONTRACTS AWARDED

Ala., Birmingham—Republic Steel Corp., Empire Blvd., water filtration plant for Virginia Mines, west of Bessemer, day labor and sub-contracts. **$15,250.**

★**Calif., San Diego**—Constructing San Vincente Dam, to L. E. Dixon Co., 609 S. Grand Ave., Los Angeles, **$1,743,908**; cement, to Southwestern Portland Cement Co., 727 W. 7 St., Los Angeles, **$672,848.** Bids 8/26 CD 9/3—ENR **9/4.**

†Fla., Starke—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., exten., imprv. water sys., Camp Blanding, to Langston Constr. Co., Orlando, **$86,159.** Awarded 8/28.

Ill., Decatur—J. L. Rehfelt, city comr., WW imprvs., etc., to R. Christie, Decatur. **$104,000.** Bids 7/28. CD 7/25.

Me., Lewiston—P. Wks. Dpt., City Hall, 15 m.g. reservoir, East Ave. Sect. **WPA. $302,000.** W. Crowell, 146 High St., Portland, dir. Operations.

†Me., Presque Isle—War Dpt., Park Sq. Bldg., Boston, Mass., steel standpipe, Army Air Corp, to Pittsburgh Des Moines Steel Co., 20 Bway., New York, N. Y., **$36,500.**

Md., Towson—Baltimore Co. Comn., Courthouse, watermains, to Nichol Palmere, 3300 White Ave., Baltimore. **$32,046.**

Pa., Allison Park—Bd. Comrs. Ross Twp., J. A. Hollinger, secy., Allison Park, at office Chester Engineers, engrs., 210 E. Parkway, Pittsburgh, Contr. 4, pipe lines, etc., to F. Kukurin, Wilmerding, **$31,996**; Contr. 5, pipe lines, etc., to Meade Constr. Co., 6101 Penn Ave., Pittsburgh, **$44,314.** Bids 8/15. CD 8/6.

Pa., Corry—Aero Supply Mfg. Co., Inc., 611 W. Main St., water supply, fdns., steel tank, to Pittsburgh-Des Moines Steel Co., Neville Island, Pa. and J. P. Peterson, Jamestown, N. Y. Est. **$20,000.** CD 6/20—ENR 6/26.

S. C., Columbia—L. B. Owens, mayor, City Hall, two 18 m.g. water pumps replacing existing pumps, City Waterworks Plant, day labor, **$20,000.**

Tex., Amarillo—H. R. Smith, city mgr., installing pump house and pump unit, to Clowe & Cowan, 223 W. 4 St., **$15,196.** Est. $18,000.

†Tex., Camp Wolters—Con. Q.M., water and sewer lines for defense housing, to W. P. Glade, 602 Sunset St., Wichita Falls, **$41,328.**

Alta., Dewinton—Dpt. National Defense for Air, Ottawa, Ont., water and sewerage sys., E.F.T. School, to Bennett & White Constr. Co. Ltd., Examiner Bldg., Calgary, **$30,000.**

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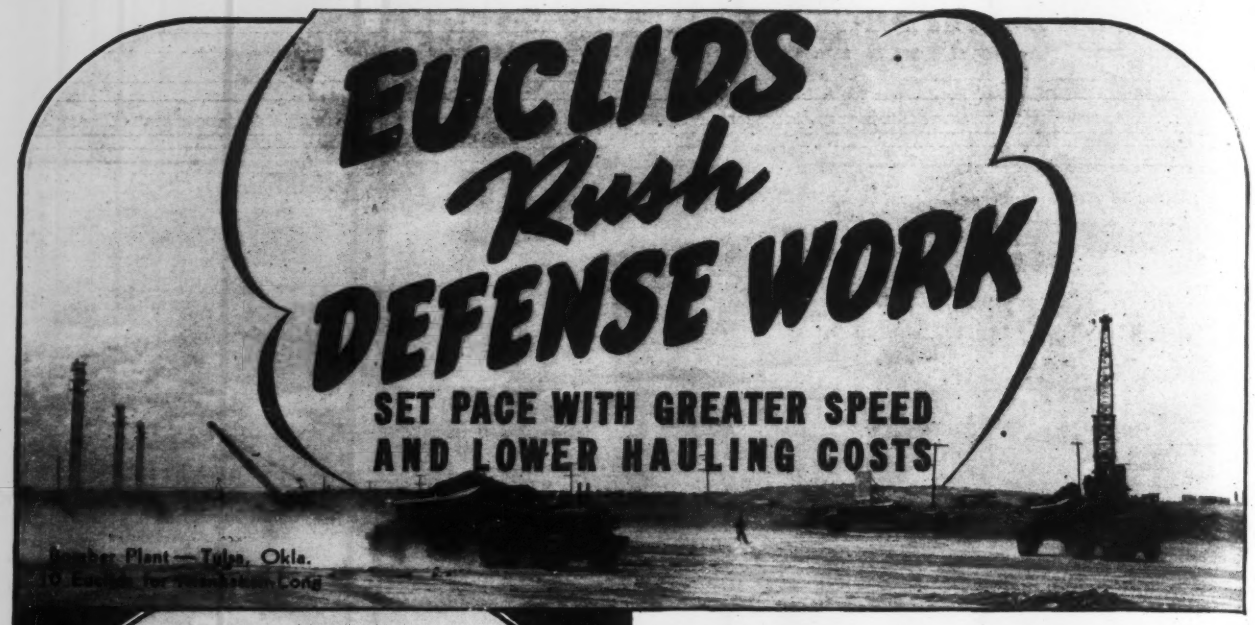

Bomber Plant — Tulsa, Okla.
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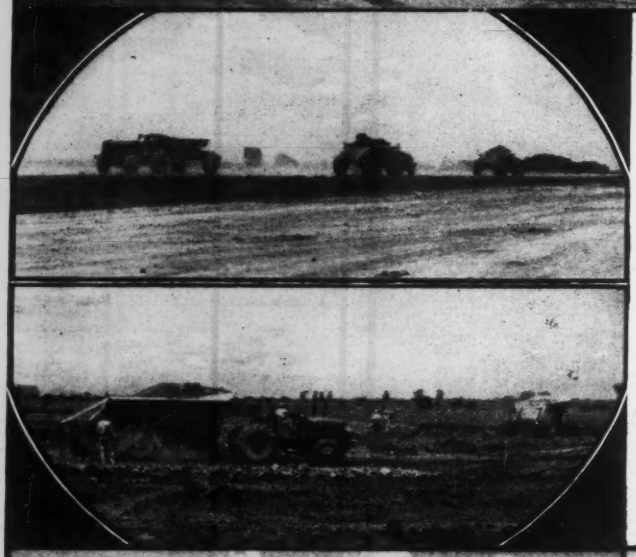

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EUCLID
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SEWERS, WASTE DISPOSAL

PROPOSED WORK

Calif., Lompoc—Surveys sewage disposal sys. $200,000. Leeds, Hill, Barnard & Jewett, 601 W. 5 St., Los Angeles, engrs.

Colo., Denver—G. E. Cranmer, mgr. Imp. & Parks, sewer facilities, eastern part Lowry Field, sewage disposal plant, near municipal airport. $247,495. Applied for PWA funds. A. K. Vickery, city engr.

Ill., McCook (P. O. Riverside or **La Grange)**—Electric-Motive Corp., of General Motors, General Motors Bldg., Detroit, Mich., sewage plant addn. G. D. Mitten, c/o owners, engr.

Ia., Danville—Sewers, sewage disposal plant. Over $25,000.

★**†La., De Ridder**—City water and sewerage sys., Docket La. 10-102. $508,222. **DPW.**

★**Mich., Royal Oak**—Oakland Co. Drain Comn., E. F. Clark, Pontiac, sewage disposal plant to serve 5 mi. area in county. Total est. $980,000. Applied for PWA funds.

Mo., Cape Girardeau—W. C. Kaempfer, city clk., 11,400 ft. 8 in. vitr. clay sewers, Red Star Subdivision. Over $25,000. J. R. Walthers, city engr.

★**Mo., Rolla**—City Clerk, sanitary and storm water sewers. WW exten. and imprvts. $500,000. Seeking WPA funds. J. F. Kilpatrick, City Hall, engr.

†N. C., Wilmington—Con. Q.M., Camp Davis, indefinitely postponed bids to have been opened Aug. 20, steel incinerator and seventeen 2 vehicle grease and inspection racks. CD 8/5—ENR 8/7.

O., Fairfield—Sewerage and WW sys. exten. $58,000. R. J. Parrish, 127 Cambridge Ave., Dayton, engr.

★**Okla., Tulsa**—Sewage disposal plant, intercepting sewers. $1,100,000. Applied for PWA allot. V. H. Cochrane, Wright Bldg., engr.

†Pa., Borough Twp.—Borough Twp., Beaver County, outfall sewerage sys., Docket Pa. 36-103. $96,000. **DPW.** M. Baker, Jr., 122 Penn Beaver Hotel, Rochester, engr. Chester Engineers, 210 E. Parkway, N.S., Pittsburgh, consult. engrs.

†Pa., Midland Borough—Borough sanitary sewerage sys., Docket Pa. 36-119, $6,650. **FWA.**

Pa., Scranton—Sewers East Mt. section. Over $30,000. F. K. Derby, city engr.

Tex., El Paso—El Paso County Water Control & Imprvt. Dist. 1, c/o M. Scarbrough, 405 Caples Bldg., sewage disposal plant, sludge drying beds, etc. $350,000; sanitary sewer collecting sys. $361,000. Franzer & Benner, 705 El Paso Natl. Bank Bldg., engrs. Applied DPW for funds. CD 7/30—ENR 8/7.

Tex., Freeport—City, c/o W. Allen, sanitary sewerage sys. imprvs. disposal plant, collecting lines. $182,025. Applied for DPW funds. H. G. Olmstead, 3905 Galveston Rd., Houston, engr.

★**Tex., Houston**—Bond election Sept. 27, installing new, repairing old sanitary sewers, $2,500,000; storm sewers, $1,400,000. J. G. Tourney, city engr.

Tex., La Marque—Galveston Co. Water Control & Imprvt. Dist. 2, c/o B. Inselman, sewerage sys., disposal plant, Tex. 41-266. $125,000. Applied for FWA funds. J. J. Rady, Majestic Bldg., Fort Worth, engr.

†Tex., Palacios—City, exten., imprv. sanitary sewerage sys., Tex. 41-103. $78,465. **DPW.**

Tex., Pottsboro—W. H. Young, mayor, City Hall, sanitary sewer disposal plant. $35,000. Applied for DPW funds. J. J. Rady, Majestic Bldg., Fort Worth, and J. Montgomery, Littlefield Bldg., Austin, engrs.

†Tex., Texas City—City, sanitary sewers, Docket Tex. 41-107, $60,000. **FWA.** CD 7/21—ENR 7/24.

Tex., Victoria—Sanitary sewerage sys. imprvs. $30,602. B. L. Fordan, mayor. Applied for DPW funds. E. F. Miles, victoria, engr.

★**Utah, Layton**—North Davis Co. Sewer Dist., c/o Caldwell & Richards, engrs., Templeton Bldg., Salt Lake City, sewerage sys. to serve communities north end Davis Co., $1,000,000. Sumner Margetts, Felt Bldg., Salt Lake City, engr.

Wis., Saukville—Sewage treatment plant, $25,000. A. E. McMahon Eng. Co., 124 Main, Menasha, engr.

BIDS ASKED

Bids Asked September 19

S. C., Greenwood—F. W. Chapman, supt. P. Wks., City Hall, abattoir, Edgewood and Cokesbury sewage disposal plants. Wiedeman & Singleton, Candler Bldg., Atlanta, Ga., engrs. CD 7/23—ENR 7/31.

Bids Asked

Tex., Corpus Christi—Barco Development Co., c/o H. M. Cohen, Cohen Lumber Co., 2310 Leeland St., Houston, installing utility sys., sanitary sewer lines, water distr. sys., natural gas distr. lines, 2 sewage pump stations, paving in Aladdin Village home development, $150,000. Haile & McClendon, 2801 San Jacinto St., Houston, engrs.

Tex., Texas City—Barco Development Co., c/o H. M. Cohen, Cohen Lumber Co., 2310 Leeland St., Houston, installing utilities sys. sanitary sewer lines, water sys., natural gas distr. lines, 2 sewage pump stations, paving in home development site. $150,000. Haile & McClendon, 2801 San Jacinto St., Houston, engrs.

LOW BIDDERS

†Va., Fort Monroe—Con. Q.M., Fort Monroe, sewage disposal sys., from Arnold M. Diamond, 134 Borum Pl., Brooklyn, N. Y., **$106,235.** CD 6/15—ENR 6/19.

CONTRACTS AWARDED

Calif., Alvarado—Trustees Alvarado Sanitary Dist., sewers, from D. Caputo, 985 Delmas St., San Jose. **$29,363.** CD 8/28—ENR 9/4.

†Fla., Starke—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., exten. sewerage sys., Camp Blanding, to R. B. Stewart, Fort Meyers, **$116,926.** Awarded 8/28.

Kan., Kansas City—City, c/o T. B. Schlup, city engr. City Hall, 8,944 ft. storm sewer, Fairfax Dist., along Kindleberger, McMath, Rinkel, Funston and White Eagle Roads. **WPA. $175,392.** R. A. Richardson, WPA area engr.

N. J., Princeton—Princeton Twp., storm drainage facilities, Valley Rd. and Prospect Ave., sanitary sewers, culverts, etc. **WPA. $60,716.** W. D. Cougle, 100 S. Broad St., Trenton, WPA engr.

N. Y., Astoria—Dpt. P. Wks., Municipal Bldg., New York, Contr. 4A, grit chamber superstructure, Bowery Bay Sewage Treatment works, to National Excavation & Structures Corp., 10 E. 40 St., New York. Est. **$50,000.** Bids 9/2. CD 8/25—ENR 8/28.

N. Y., Chautauqua—Chautauqua Utilities Dist., W. H. Wheeler, chn. in charge, modernization existing sewage disposal plant, own forces under supervision. C. C. Cheney, Salamanca, engr. **$25,000.** CD 8/15—ENR 8/21.

Tex., Cuero—Brayton Flying Service, Inc., c/o C. Brayton, pres., Lambert St. Louis Municipal Airport St. Louis, Mo. and c/o Love and Hicks Fields, Dallas, Tex., sanitary sewerage sys., day labor. **$30,000.** E. F. Miles, c/o owner, and city, engr.

Tex., Hale Center—Sanitary sewerage sys., disposal plant. **WPA. $54,200.**

Tex., San Angelo—Sewage disposal imprvs., Imhoff tanks, pump house, etc. **WPA. $51,000.**

Tex., Sinton—A. L. Sims, mayor, storm sewers, to F. M. Reising, Edinburg, **$39,486.** Est. $40,000. Bids 8/29. CD 8/21.

Que., Hull—Wartime Housing Ltd., 55 York St., Toronto, Ont., sewers, water sys. to new housing units, to Hull Paving & Constr. Co. Ltd., 187 Principale St., about **$100,000.**

Que., Montreal—J. E. Gautheir, city clk., sewers St. Timothee and Berri Sts., to Charles Duranceau Ltd., 5847 Hamilton St., **$29,348.** J. Brousseau, City Hall, engr.

BRIDGES, GRADE CROSSINGS

PROPOSED WORK

Ark., Warren—Arkansas Hy. Dpt., Little Rock, bridge over Saline River, Hy. 4, $250,000. W. W. Zass, 316 Fern St., Little Rock, engr.

Missouri—State Hy. Comn., Jefferson City, four 19 ft. creosoted timber span bridge over Kelley Springs Branch, Goodman-Anderson Rd., Route 71, Proj. SN FA 146 A1; two 17 ft. and two 15 ft. creosoted timber spans, over Kelley Springs Branch, Route 71, Proj. SN FA 146 A1, same road; two 12 ft. rein.-con. slab span, culver type bridge, Route 71, Proj. SN FA 146 A1, same road; two 12 ft. rein.-con. slab spans bridge, over stream, all foregoing McDonald Co.; two 10 ft. rein.-con. slab span, culvert type bridge over Turkey Creek, Cross Timbers East Rd., Route SP Sect. 1A, Hickory Co.; nine 45 ft. rein.-con. deck girder span bridge over Littlenorth Fork of White River, Theodosia-Gainesville Rd., Route SC Proj. FAS 425 A2, Ozark Co. C. W. Brown, Jefferson City, engr.

New Jersey—State Hy. Dpt., Trenton, received no bids Sept. 5, steel, concrete bridge, Grassy Sound, State Hy. Rt. S-49, Sect. 5, Wildwood, Cape May Co. CD 8/19—ENR 8/21.

†Pa., Borough Twp.—Borough Twp. bridges, roads and draining, Docket Pa. 36-102. $53,000. **DPW.** M. Baker, Jr., 122 Penn Beaver Hotel, Rochester, engr. Chester Engineers, 210 E. Parkway, N.S., Pittsburgh, consult. engrs.

Texas—State Hy. Comn., B. P. Gentry, chn., Austin, bids soon Pecos River Bridge, 0.036 mi. U. S. Hy. 80, Reeves Co.; 2 rein.-con. bridges, Big Creek and Dinton Creek, 0.16 mi. U. S. Hy. 67, Robertson Co.

BIDS ASKED

Bids Asked September 15

Ontario—R. M. Smith, deputy minister Dpt. Hys., Toronto, bridges over Pagwachuan River, over Kabniakagami River, both west of Hearst; over Gull River, near Ignace; over Driftwood River, west of Cochrane. $100,000-$150,000.

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Nominal inside dia. of pipe, in.	Depth of joint, inches of Leadite	Approx. lbs. of Leadite per joint	Depth of joint, inches of lead	Approx. lbs. of lead per joint
4	2.5	2.00	2.25	8.56
6	2.5	3.00	2.25	11.71
8	2.5	4.00	2.25	14.63
10	2.5	5.00	2.25	17.70
12	2.5	6.00	2.25	20.86
14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	40.71
24	2.5	13.00	2.50	53.02
30	2.75	16.00	2.50	65.36
36	2.75	19.00	2.50	77.96
48	3.50	30.00	3.00	121.15
54	4.0	38.00	3.00	135.60
60	4.0	42.00	3.00	150.70

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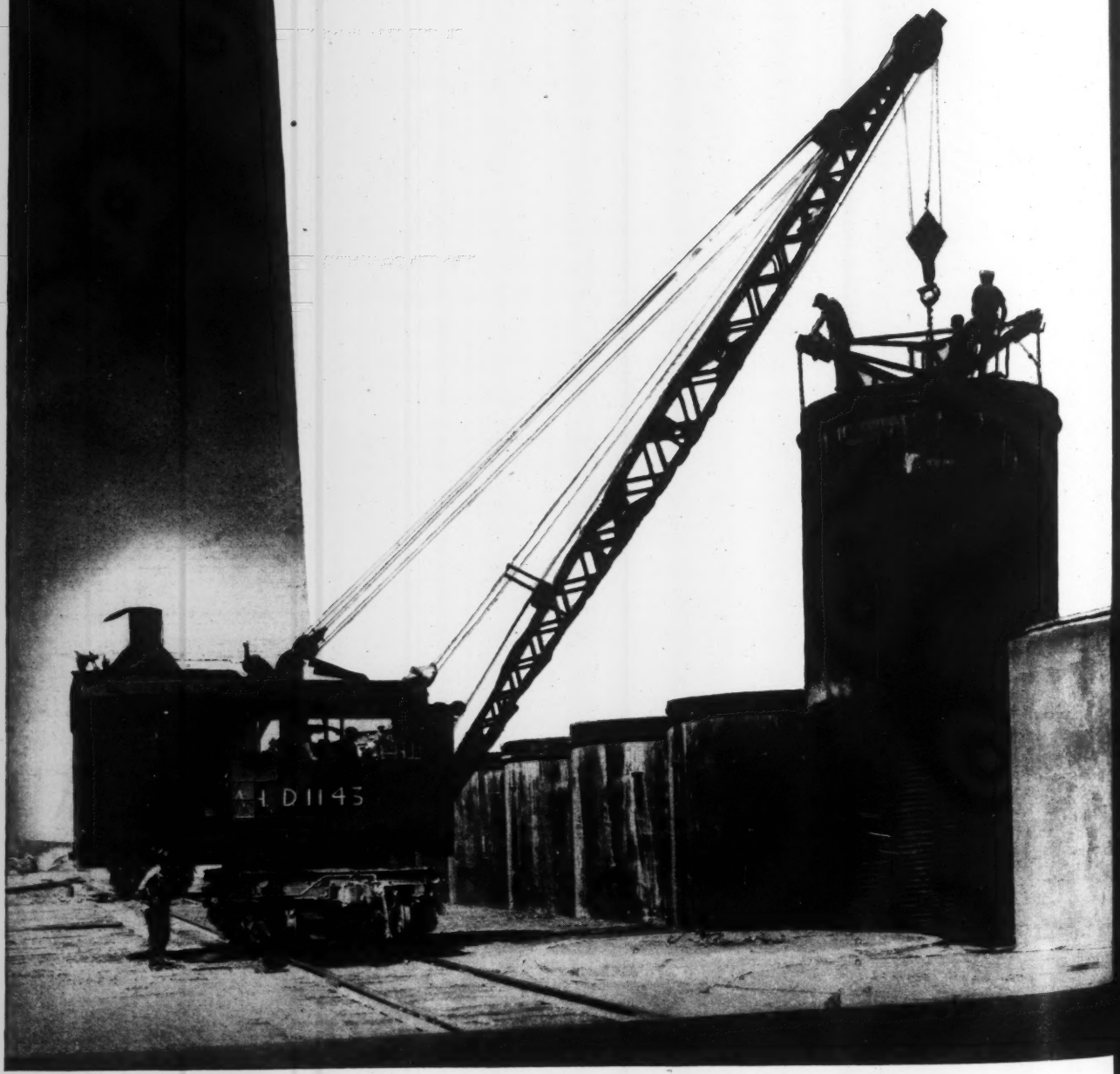

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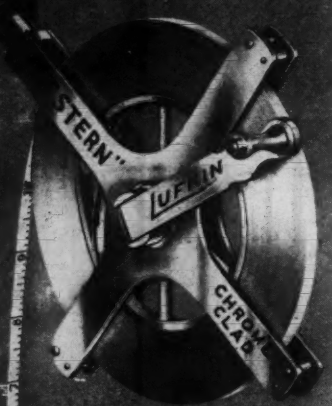

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BRIDGES, etc. (Bids Asked, Cont'd.)

Bids Asked September 18

New Hampshire—State Hy. Dpt., Concord, 140 ft. steel truss bridge, approaches, Errol, Coos Co. $50,000. J. W. Childs, Concord, engr.

Bids Asked September 24

Louisiana — Dpt. Hys., Baton Rouge, W. Prescott Foster, dir., Keithville overpass of Southern Pacific R.R., Rt. 1, Shreveport-Mansfield Hy., S.P. 913-143 FA Grade Crossing Proj. FAGH 68-G, Caddo Parish.

LOW BIDDERS

Arizona—State Hy. Comn., Phoenix, Aug. 27, reconstructing overpass 2.1 mi. hy. Phoenix-Prescott Hy., from Skousen Bros., 243 W. 1 St., Mesa. **$165,137.** CD 8/21.

Calif., San Francisco—S. J. Hester, secy. Dpt. P. Wks., City Hall, Aug. 27, repairing 4 St. bridge over Channel St., from J. P. Murray, 3901 Mission St. **$27,636.** CD 8/13—ENR 11/21.

Connecticut—State Hy. Comn., W. J. Cox, comr., Hartford, Sept. 3, two T-beam bridges, Sandy Brook Rd. and 2,857 ft. Hy., Colebrook, from Charter Oak Constr. Co., Inc., 525 Main St., Hartford. **$48,288.** Received bids Sept. 3, bridge over Farmington River, Windsor. CD 8/23—ENR 8/28.

Conn., New Haven—P. Wks. Dpt., Hall of Records, Sept. 5, bridge repairs, Chapel St. draw new grid deck, from Leake & Nelson Co., Inc., 203 Ash St., Bridgeport. **$32,300.** Est. $30,000. CD 8/28—ENR 8/4.

Illinois—State Dpt. P. Wks. & Bldgs., Springfield, Aug. 29, fabrication, del. structural steel for arch and girder bridge over Rock River, Lee and Ogle Counties, from Bethlehem Steel Co., Wrigley Bldg., Chicago, **$212,277.** CD 8/21 under Roads.

Kan., Kansas City—Wyandotte Co., Court House, Sept. 2, repairing James St. bridge over Kaw River, from Howard & Co. Inc., 35 E. Wacker Dr., Chicago, Ill., **$121,000.** Est. $145,000. CD 8/20—ENR 8/28.

Minnesota—State Hy. Dpt., St. Paul, Aug. 22, Bridge 5891, Hennepin Co., from Fielding & Shepley, 1258 Bohn St., St. Paul, **$83,328.** CD 8/6—ENR 8/14.

Nebraska—State Dpt. Roads & Irrigation, Lincoln, Aug. 28 culverts 11.8 mi. Hy. 240-A, Oxford-Orleans, from Roberts Constr. Co., Lincoln, **$27,381;** bridges same road, from Bushman Constr. Co., St. Joseph, Mo., **$44,239** ***culverts 9.7 mi. Hy. 205-B and C, Riverton-Franklin, from Orshek & Christensen, Fremont, **$32,467;** bridges same road, from Capital Bridge Co., Lincoln, **$25,515.** CD 8/15—ENR 8/21 under Roads.

†**Oregon**—Public Roads Admin., Post Office Bldg., Portland, Aug. 27, 3 span 160 ft. rein.-con. deck girder bridge over Hubbard Creek, on Oregon Coast Hy., Curry Co., from T. Lillebo, Reedsport. **$33,116.** CD 8/19.

Texas—D. C. Greer, engr. State Hy. Dpt., Austin, Aug. 28, Starks Creek Bridge, Kimble Co., from E. Loyd, Box 1077, Fort Worth. **$28,912.** Est. $30,000. CD 8/20.

Texas—D. C. Greer, engr. State Hy. Dpt., Austin, Aug. 29, Dry Devil's River and relief bridge, Edwards Co., from Thomas & Ratliff, Rogers, **$42,146** est. $44,444; F. W. and D. C. R.R. overpass, Donley Co., from Bell & Braden, Herring Hotel Bldg., Amarillo, **$71,578** est. $81,088. CD 8/20.

CONTRACTS AWARDED

Calif., Los Angeles—Atchison, Topeka & Santa Fe Ry. Co., M. C. Blanchard, ch. engr. (coast lines) 560 S. Main St., pier supports over Los Angeles River, to Griffith Co., 502 Los Angeles Railway Bldg., **$36,673.**

Kansas — State Hy. Dpt., Council Grove, Bridge 21.5, Morris Co., to W. B. Honska Constr. Co., Salina. **$27,393.** Bids 8/22, awarded 7/3. CD 8/12—ENR 8/14.

Kansas — State Hy. Dpt., Osawatomie, to F. H. Freeto, Pittsburg, bridge, Cherokee and Crawford Counties, **$25,319** *** to Geiger & Rutherford, Leavenworth, Bridge 10-1, **$85,577;** Bridge 10-4, **$25,264;** Bridge 10-9, **$34,120,** all foregoing in Miami Co. Grand total $170,-280. Bids 8/27, awarded 9/3. CD 8/12—ENR 8/14.

Minnesota—State Hy. Dpt., St. Paul, Bridge 6404, Bridge 6405 over Chanarambie Creek, State Rd. 4, Bridge 6406 over Rock River, Bridge 6407 over Poplar Creek, S.A. R. 9 from Trosky to point ¼ mi. east Edgerton, to Minneapolis Bridge Constr. Co., P. O. Box 1143, Minneapolis. **$30,966.** Bids 8/15. CD 7/30—ENR 8/7.

★**New Jersey**—E. D. Sterner, comr. State Hy. Dpt., Trenton, Cheesequake Creek Bridge, Middlesex Co., to Felhaber Pile Co., 205 E. 42 St., New York, N. Y., **$942,893.** Bids 8/22. CD 8/26—ENR 8/28 under LB.

N. J., Bridgewater—Central Railroad Co. of N. J., A. E. Owen, ch. engr., Reading Terminal, Phila., Pa., grade crossing elimination, excavating, constructing depressed concrete road and rein.-con. railroad bridge, Bound Brook Rd., to Ell-Dores Contg. Co., 644 Nye Ave., Irvington. **$225,000.**

★**O., Columbus**—Franklin Co., new steel, concrete bridge, underpass structure beneath New York Central R.R. tracks, widening Sandusky St., erecting overpass, McKinley Ave., **WPA, $900,000.** A. C. Slad... Columbus, co. engr.

Ore., Portland—State Hy. Comn. ...lem, constructing westerly approach ...rison St. bridge over Willamette River, to ...rkeme & Saremal, Sherlock Bldg., Portland ... $106,582. Bids 9/4. CD 8/28—ENR 6/26.

STREETS AND ROADS

BIDS ASKED

Bids Asked September 15

Connecticut—State Hy. Comn., W. J. Cox, Comr., Hartford, rein.-con. paving 12,000 ft. FAP SN 41 E(1), Southbury, Over ... $20,000.

Connecticut—W. J. Cox, Comr. State Hy. Dpt., Hartford, bituminous macadam paving 1,350 ft. Canton; 2,542 ft. Winsted-Barkhamsted; drainage 2,608 ft. East Lyme; drainage, bithulithic concrete and bituminous macadam approaches 1,584 ft. Farmington; rein.-con. paving 1,426 ft. and bituminous macadam paving 80 ft. New Haven, East Haven and Branford; bithulithic concrete and rein.-con. paving 1,426 ft. East Haven and Branford; rein.-con. paving 492 ft. Foxon Rd., New Haven; bituminous macadam paving ... ft. Hartland; 3,947 ft. Rocky Hill and Wethersfield; rolled bank run gravel surfacing concrete slab bridge over Salmon Creek, 4,... ft. Salisbury; rolled bank run gravel surfacing 2,900 ft. Wilton.

Bids Asked September 16

Ill., Marengo—Comb. concrete curbing and guttering, 0.4436 mi. Sect. 2-CS. G. H. Baker, Centennial Bldg., Springfield, state engr. ... roads and city streets.

Ohio—State Hy. Dpt., Columbus, grading, drainage structures, widening, asphaltic concrete widening 5.371 mi. Sect. Lima and ... SH 659, Allen Co., $121,000; drainage structures, widening, resurfacing 4.767 mi. Sects. E and I of SH 7, U. S. 52, Clermont Co., $70,600; grading, drainage structures, rein.-con paving 0.433 mi. Sect. A, East Palestine, SH 89, Columbiana Co., $35,000; grading, drainage structures, concrete beam bridge on concrete substructures over branch East Fork Mill Creek and asphaltic concrete widening, resurfacing 0.113 mi. Sect. A, SH922, Hamilton Co., $34,900; grading, drainage structures, new base, widening, asphaltic concrete surfacing 1,278 mi. Sects. South Point and M-3 of SH 7, US52, Lawrence Co., $52,000; 1.677 mi. Loram Co., $37,400; grading, corrugated metal sectional plate arch culvert over Rannells Creek surfacing 0.151 mi. Noble Co., $12,659; installing creosoted strip flooring, painting stringers, floor beams, bridge over Muskingum River, Washington Co., $11,870.

O., Cincinnati—Concrete paving, sewers, W. H. Taft Rd. from Jefferson to Eden Aves. $61,541. H. H. Kranz, City Hall, engr.

Bids Asked September 17

N. J., Phillipsburg—Bituminous concrete or penetration macadam surfacing 10,705 sq. yd. Lock and Logan Sts. H. W. Mixsell, Town Hall, engr.

N. Y., New York—President Manhattan Boro, Municipal Bldg., concrete sidewalks, ... front East Harlem Housing Project, E. 102, 105 Sts., 1 Ave. and East River Dr.

Bids Asked September 18

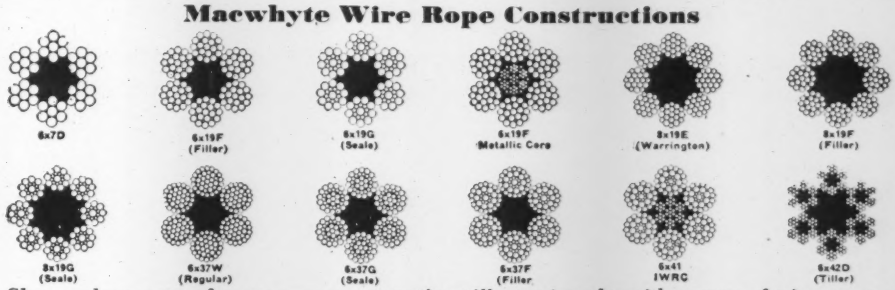
New Hampshire—State Hy. Dpt., Concord, 4 in. on gravel surfacing 2.775 mi. Old State Rd., Merrimack Co. $50,000. J. O. Morton, Concord, engr.

North Carolina—State Hy. & P. Wks. Comn., Raleigh, grading 8.46 mi. P. 149, Polk Co., $50,000-$75,000; structures same road $15,000-$25,000; mixing sand asphalt base and surface course material 10.61 mi. P. 154, Martin Co., $25,000-$50,000; grading, soil type base course, bituminous surface treating 9.73 mi. P. 2434, Johnston Co., $100,000-$125,000*** structures on same road under $15,000; grading, soil type base course bituminous surface treating, structures 3.96 mi. P. 3021, Bladen Co., $25,000-$50,000; grading, concrete paving 1.08 mi. P. 4105, Durham Co., $50,000-$75,000; grading, T.B.M. and bituminous surface treating, structures 4.7 mi. P. 595, Yancey Co. $125,000-$150,000; grading 11.87 mi. P. 6245, Burke and Catawba Counties, $250,000-$300,000; structures same road, $75,000-$100,000. W. V. Baise, Raleigh, engr.

Bids Asked September 19

Georgia—State Hy. Dpt., W. E. Wilburn, chn., Atlanta, grading, 2 bridges, 1 bridge culvert 3.071 mi. hy. Stewart Co; grading, 1 bridge, 1.778 mi. Springfield-Clyo Rd., Effingham Co.; surface treating 5.013 mi. Odum-Screven Rd., Wayne Co.; grading 1.95 mi. State Route 61-State Route 92 Rd., Paulding Co.; highway crossing signal installation at Savannah and Atlanta R.R. on Savannah-Port Wentworth Rd., Chatham Co.; surface treating 7.575 mi. Bainbridge-Camilla Rd., Decatur and Mitchell Counties; 5.088 mi. State Route 59-Toccoa Rd., Franklin Co.; grading, surface treating 6.668 mi. Sparta-Sandersville Rd., Hancock Co.; 6.933 mi. Lincolnton, Gar-McCormick, S. C. Rd., Lincoln Co.; bituminous stabilized road bed mix with surface treatment road 4.535 mi. Midway-Dorchester Rd., Liberty Co.

Macwhyte Wire Rope Constructions



Shown above are a few common constructions illustrating the wide range of wire ropes available to meet various degrees of flexibility and abrasion resistance in operation.

Select The CORRECT Wire Rope For Your Equipment—Save Time and Money

(No. 8 in a series of informative articles for wire rope users prepared by the Macwhyte Wire Rope Company. Previous articles in this series are available on request on your company letterhead.)

Your wire ropes are subjected to . . .

1 **Bending fatigue.**
2 **Abrasive wear.**
3 **Loading stress.**

A Wire Rope is designed either to give most satisfactory service under any one of the above conditions . . . or any combination of them.

You must determine (or let Macwhyte engineers determine for you) the major factors affecting your ropes; then install the rope that will meet these factors to the best advantage.

Remember, wire ropes must have:

Flexibility to meet *bending fatigue.*
Abrasion resistance to meet *abrasive wear.*
Strength to meet *loading stresses.*

How to Determine Flexibility

Flexibility of a wire rope is determined by the number and size of its wires. Generally speaking, a rope with a small number of large wires is (See Fig. A) much less flexible than a rope with a greater number of smaller wires (See Fig. B).

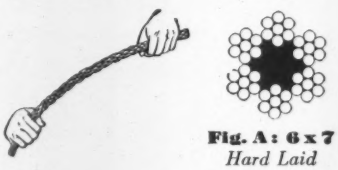


Fig. A: 6 x 7
Hard Laid

Fig. B: 6 x 37
Special Flexible

Between these two extremes are numerous wire rope constructions that vary the degree of flexibility. The flexibility needed is determined by the smallest diameter sheave or drum on the equipment. Wire rope catalogs contain information regarding proper sheave diameters for various constructions of rope but it must be remembered that often flexibility must be sacrificed for abrasion resistance and a compromise is often necessary.

One of the reasons why Monarch Whyte Strand PREformed wire rope has become so popular is because the preforming of the rope increases its flexibility which is especially valuable where a compromise is necessary to get the best service.

How Abrasion Resistance Is Determined

The *abrasion resistance* of a wire rope is determined principally by the number and size of the *outside wires* in each strand in the wire rope. The wire rope, Figure A, for example, has high abrasion resistance. Notice that this rope has fewer but larger outside wires than rope Figure B. However, even though there might be an extreme abrasion condition of service that would normally require a rope having the best abrasion resisting characteristics, yet a compromise must often be made where sheaves are relatively small.

How Strength Is Determined

The strength of wire rope required for a specific piece of equipment depends a great deal upon the necessary safety factor of operation required.

A wire rope is never used up to its maximum strength. Many factors such as bending, and friction through sheaves and around drums, and also in some cases the weight of the rope itself adds considerably to the actual load that the rope is caused to sustain.

Therefore, each type of operation usually has a specific safety factor which must be considered before it can be determined whether or not a specific rope is strong enough for the job. (Copies of previous articles in this series discussing safety factors are available on request.)

What to Do

There have been many installations where the proper application of wire rope has doubled the service with a consequent double saving in wire rope dollars. Keep service records on the basis of tons of material handled, car miles traveled, ton miles, etc., rather than hours and days of service to see how the specific wire rope you are using likes its work.

Consult with Macwhyte Company or any one of its many distributors on any question pertaining to wire rope, its application, and the service you are getting.

There are hundreds of installations like yours on which Macwhyte wire rope engineers have had experience. They can save you the trial and error method of determining the best rope for your use.

The new Macwhyte general wire rope catalog G-14 contains over 60 pages of helpful information that will save you money. Write for a copy on your company letterhead.

NO. 574

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. . . the CORRECT rope for your equipment

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2930 Fourteenth Avenue · Kenosha, Wis.
Manufacturers of Wire Rope to meet every need—left-&-right lay braided slings—stainless steel wire rope—monel metal wire rope—aircraft cable, aircraft tie rods, Safe-Lock cable terminals.
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A New Economy....
for ELECTRIC-GAS-WATER COMPANIES, MUNICIPALITIES and CONTRACTORS

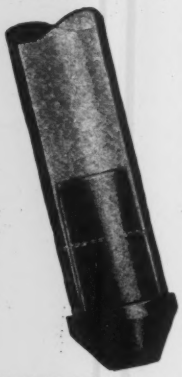
ATLANTIC PNEUMATIC PIPE DRIVER

Pays for Itself on First Job!

Universal Joint between driving head and shank widens working angle, simplifies driving in small spaces.

DRIVES PIPE UNDERGROUND 25 Ft. an hour!

Up to 2" pipe through ordinary soil. Drives under highways, abutments, lawns, etc., without excavating. No delay coupling added lengths; no burring pipe ends.



NO TRENCHING BACKFILLING, OR SURFACING

Takes Power from Standard Paving Breaker!

A SIZE FOR EVERY SERVICE!

Only 3 parts: Driving point, driving head, driving shank. Weighs only 8 lbs. Standard sizes fit from 1" to 2" standard pipe. Special sizes for extra heavy pipe. Shank fit standard pavement breakers. Lasts for years. Pays dividends over and over again. Acme of simplicity and low cost!

Made from Select Steel, Specially Heat-treated to Withstand Heavy Blows.

ATLANTIC STEEL COMPANY
1775 BROADWAY, NEW YORK

STREETS, etc. (Bids Asked, Cont'd.)

Kentucky—Dpt. Hys., Frankfort, grading, draining 8.773 mi. Elizabethtown-Fort Knox Rd., AW-FA 79 A (2), SP 47-19, Hardin Co.; 3.945 mi. Louisville-Elizabethtown Rd., AW-FA 26 (7), AW-FA 79 F (1), SP 56-178 SP 47-39, Jefferson and Hardin Counties; medium type surfacing 2.797 mi. Henderson-Smith Mills Rd., A1-FAS 56 A (1), SP 51-239, Henderson Co.; bituminous surfacing 11.633 mi. Carrollton-Gratz Rd., SP 52-27, Henry Co.; concrete bridge over Elkhorn Creek, Elkhorn City-Shelby Gap Rd., SP 98-263, Pike Co.

Minnesota—State Hy. Dpt., St. Paul, stabilized gravel shoulders 29.92 mi. Trunk Hy. 61; Dist. 2; 39.63 mi. Trunk Hys. 10 and 271, Dist. 4; 16.4 mi. Trunk Hy. 10, Dist. 6; 4.2 mi. Trunk Hy. 212, Dist. 9; 29.6 mi. Trunk Hy. 65, Dist. 13; 31 mi. Trunk Hy. 169, Dist. 14. J. T. Ellison, c/o owner, ch. engr.

Minnesota—State Hy. Dpt., St. Paul, grading, gravel surfacing 7.7 mi. S.P. 1106-02, Trunk Hy. 34-34 and S.P. 1107-01, FAP 368 A (2); grading, stabilized gravel surfacing 6.4 mi. S.P. 4711-05, FAP 442 G (1); grading, gravel surfacing 3.3 mi. S.P. 4804-01, S.P. 3304-05, and S.P. 4815-04; stabilized gravel surfacing 2.6 mi. S.P. 5305, FAP 523 1; 2.1 mi. S.P. 6111-06, FAS 69 A (2); grading 3.7 mi. S.P. 7102-13, SN-FAP 60 (3); sand gravel fill, stabilized gravel surfacing 10.5 mi. S.P. 7506-01; bituminous material (MC and RC) and mineral aggregate surfacing 1.2 mi. S.P. 7101-12, SN-FAP 44; bituminous material, surfacing, bridges 2.5 mi. S.P. 3606-06; curbing, guttering, gravel, binder soil surfacing 9.1 mi. S.P. 7201-11, FAP 587 A (2); concrete paving, grading 0.4 mi. S.P. 0119-02; grading 3.5 mi. S.P. 3411; curbing, 892 lin. ft., 5,973 sq. ft. sidewalks, S.P. 4606-03; in Fairmount; 5 box culverts, concrete paving, S.P. 4711-07, FAP 442 (1); 1 box culvert, 99 cu. yd. concrete S.P. 5305-10, FAP 523 1; grading 0.1 mi. S.P. 2706-08; 6.9 mi. Proj. 65-506-01, FAS 186 A (1), Renville Co. J. T. Ellison, ch. engr.

†**Montana**—Pub. Roads Admin., Missoula, clearing, grubbing, grading, draining 1.326 mi. Rogers Pass Hy., Helena Natl. Forest, Lewis and Clark Co.

Pensylvania—State Hy. Dpt., I. L. Hughes, secy., Harrisburg, rein.-con. paving, bituminous on native stone type B or crushed aggregate surfacing 7,749 ft. Legislative Route 67, Sect. R-2, Traffic Route 422, Elderton Boro, Plum Creek Twp., Armstrong Co.; rein.-con. paving, bituminous on native stone type A or crushed aggregate surfacing, rein.-con. bridge 18,128 ft. Legislative Route 41, Sect. 1-A, Traffic Route 34, South Middleton Twp., Cumberland Co.; rein.-con. paving, rein.-con. structures, bituminous on crushed aggregate surfacing 7,267 ft. Appl. 721, Sec. 1 Traffic Route 663. Upper Hanover Twp., Montgomery Co.; rein.-con. paving, two I-beam bridges, bituminous on native stone, type A or crushed aggregate surfacing 19,778 ft. Legislative Route 269, Sect. 3, Traffic Route 219, Somerset and Lincoln Twps., Somerset Co.; bituminous on native stone type A or crushed aggregate, surfacing, 3 rein.-con. structures, exten. existing structure 28,756 ft. Legislative Routes 299 and 17, Traffic Routes 414 and 220, Franklin and Monroe Twps., Monroe Boro, Bradford Co.; rein.-con. paving, rein.-con. structure, I-beam bridge 12,579 ft. Legislative Routes 13002, Sect. 1, 13005 Sect. 1-B, Traffic Route 355. Lehighton Boro, Mahoning Twp., Carbon Co.; bituminous on native stone, type A or crushed aggregate surfacing 28,853 ft. Legislative Routes 14025 and 58. Traffic Route 220. Spring and Walker Twps., Centre Co.; bituminous on native stone type A or crushed aggregate surfacing, rein.-con. bridge 650 ft. Legislative Route 62016, Fallowfield Twp., Washington Co. T. C. Frame, c/o owner, ch. engr.

Bids Asked September 24

Louisiana—Dpt. Hys., Baton Rouge, W. Prescott Foster, dir., bituminous surface treating 7.953 mi. Lemannville-Donaldsonville, Vacharie St. James and Vacharie South Hys., Routes 30 and 83, Projs. 63-10-10, 63-08-09 and 65-07-05 Ascension and St. James Parishes.

Bids Asked September 26

★**Pennsylvania** — State Hy. Dpt., I. L. Hughes, secy., Harrisburg, rein.-con. paving, 3 rein.-con. structures, exten. existing structure, 2 rein.-con. bridges, bituminous surfacing 23,200 ft. Sched. 2, Comb. of 1 and 2, Sched. 3, Route 42, Sect. 1, Traffic Route 140, Germany, Union, Mount Joy and Cumberland Twps., Littlestown Boro, Sched. 1 between Two Taverns and Littlestown Sched. 2, betw. Two Taverns and Gettysburg, Adams Co. Over $500,000. T. C. Frame, c/o owner, ch. engr.

Bids Asked September 30

Montana—State Hy. Comn., Helena, grading, surfacing 14.483 mi. Baker-Wibaux Rd., Fallon Co.; grading, surfacing, bridges 7.566 mi. Roy East Rd., Fergus Co.; grading, surfacing, oiling, bridges, 3.9 mi. Deer Lodge-Butte Rd., Deer Lodge Co.; grading, surfacing, bridges, 6.048 mi. Vigilante Trail, Madison Co.; grading, surfacing, oiling, bridges 12.935 mi. Round-up-Forsyth Rds., Musselshell and Rosebud Counties; grading, surfacing, oiling, 3.316 mi. Hamilton-Stevensville Rd., Ravalli Co.; 2.665 mi. Kalispell-Half Moon Rd., Flathead Co.; grading, surfacing 2.468 mi. Bridger Canyon Rd., Gallatin Co.; 7/115 mi. Baker-Wibaux Rd., Wibaux Co.

Bids Asked

Alabama—State Hy. Dpt., Montg[illegible] rejected bids Aug. 22, grading, drain[illegible] Chert surfacing, bridge erections, removal [illegible] tures, Collinsville-Grossville Rd., DeKalb [illegible] grading, drainage, surface treatment, bri[illegible] erections, Heflin-Lineville Rd., Cleb[illegible] bridge, approaches, Patton Creek, [illegible] ham-Montgomery Rd., Jefferson Co. [illegible] advertise. CD 8/12—ENR 8/14.

Arizona—State Hy. Dpt., Phoenix [illegible] bids Aug. 1, imprv. 2.8 mi. Ash F[illegible] staff Hy. Over $100,000. Will re[illegible] CD 8/7—ENR 8/14 under LB.

California—C. H. Purcell, engr. [illegible] Dpt., Sacramento, withdrew bids to [illegible] opened Aug. 27, grading 1.2 mi. F[illegible] Will readvertise. CD 8/11—ENR 8/14

Kansas—State Hy. Dpt., at offic[illegible] Clk., Clay Center, rejected bids Aug. [illegible] 3.98 mi. K2076, Washington Co.; [illegible] K 2075, Jewell Co. CD 7/22—ENR [illegible]

Kentucky—Dpt. Roads, Frankfort, rejected bids Aug. 22, imprv. 0.274 mi. hy. Boyrton Co.; 5.777 mi. Clinton Co. CD 8/27—ENR 9/4 under LB.

Virginia—Dpt. Hys., Richmond, withdrew bids to have ben opened Sept. 9, imprv. 0.6 mi. Norfolk Co.; bridge over Miles Creek, Mecklenburg Co. CD 8/28—ENR 9/4.

LOW BIDDERS

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, Aug. 27, imprv. 0.7 mi. in Placer Co., from Poulos & McEwen, Box 1071, Sacramento. **$26,728.**

Colo., Denver—City and Denver Co., imprv. roadways, constructing drains, Street Imprvt. Dists. 157 and 158, from M. R. Latimer, 3625 Platte St., **$66,878** and **$62,383** respectively*** concrete paving, Alley Paving Dist. 210, from F. M. Kenney, 56 Steele St., **$39,813.**

Connecticut—W. J. Cox, comr. State Hy. Comn., Hartford, Sept. 3, imprv. 5,160 ft. in Branford, from Clark-Barone Co., 595 Legion Ave., New Haven, **$46,888***4,194 ft. Simsbury, from Innis Bros., Inc., 48 Clay St., Thomaston, **$38,155***950 ft. and 20,257 ft. Trumbull and Shelton from Sternberg & Kessler, West Hartford, **$58,003***2,993 ft. Greenwich, from P. Bacco, 179 Bedford St., Stamford, **$61,095.** State Hy. Comn. received no bids Sept. 3, imprv. 5,526 ft. East Granby. CD 8/25—ENR 8/28.

Idaho—State Dpt. P. Wks., Boise, Aug. 29, roadbed, drainage structure, oiling 2.5 mi. Sawtooth Park Hy., between Twin Falls and Rim to Rim Bridge, from D. Cavanaugh, Twin Falls, **$72,735.**

Idaho—Office A. C. Merrit, comr. P. Wks., Boise, Sept. 5, roadbed and drainage structures 17.6 mi. Lemhi Hy., from D. J. Cavanaugh, Twinn Falls. **$102,932.** CD 8/28.

Illinois—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, Aug. 29, imprv. 4.8383 mi. Macoupin Co., from H. M. Johnson, Mt. Olive, **$40,095***3.44 mi. Hancock Co., from Hurden Constr. Co., 614 Reisch Bldg., Springfield, **$205,787***2.34 mi. Ogle Co., from Thornton Cartage Co., Thornton, **$83,468***0.39 mi. Cook Co., from Pickus Engr. & Constr. Co., 706 Elm St., Winnetka, **$41,412.** CD 8/21.

Ill., Aurora—City, Aug. 25, Sheet asphalt paving 1.041 mi., J-2, J-3, or J-5, Sect. 15-CS, from Geneva Constr. Co., Aurora. **$40,428.** CD 8/21.

Mich., Wyandotte—Wayne Co. Road Comn., 3800 Barlum Tower, Detroit, Aug. 28, imprv. 0.625 mi. West Jefferson Ave., (Biddle St.) from Oak Constr. Co., Royal Oak. **$92,854.** CD 8/22.

★**Minnesota**—State Hy. Dpt., St. Paul, Aug. 22, imprv. 10.9 mi. SP 0116-13, from Central States Constr. Co., 403 Central Ave., Duluth, **$309,810***3 mi. S. P. 5619-02, from Megarry Bros., St. Cloud, **$35,250***6.1 mi. S. P. 4704-05 from Schultz-Griffis Co., 4631 Wentworth Ave., Minneapolis, **$45,406***6 mi. S.P. 7805-10, and S.P. 7806-01 and S.P. 7803-01, SN-FAP 343 D(2) and 164(5), from Judd Brown and Lundin Bros., Mankato, **$35,018***8.3 mi. P. 24-502-01, Freeborn Co., from Sorensen Bros., P. O. Box 577, Albert Lea, and F. C. Nelson, Geneva, **$30,657***7.7 mi. P. 59-502-01, Pipestone Co., from G. H. Lowe, 509½ 3 Ave. S.E., Cedar Rapids, Ia., **$27,947***2.9 mi. P. 85-504-01, Winona Co., from Morse Bros., Rochester, **$29,572.** CD 8/6—ENR 8/14.

Nebraska—State Dpt. Roads & Irrigation, Lincoln, Aug. 28, imprv. 11.8 mi., P. 240-A, Oxford-Orleans, from Platte Valley Constr. Co., Grand Island, **$58,405***0.4 mi. Court St., Beatrice, P. 122-A and E, from Meridian Constr. Co., York, **$27,947***0.4 mi. SN-296-C, Ogallala east, from Roberts Constr. Co., Lincoln, **$37,130***13.6 mi. P. 229, Tecamah-Decatur, from M. M. Lippincott and J. E. Shearer & Son, Hastings, **$33,321***9.7 mi. P. 205-B and C, Riverton-Franklin Rd. from Gerhold-Matzen Co., Columbus, **$61,772***12.2 mi. P. 164-B, C and D, Hebron-Nelson, from Peter Kiewitt Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, **$41,758.** State Dpt. Roads & Irrigation, Lincoln, rejected bids Aug. 28, imprv. Pawnee City South Rd. and Dubois-Barnston Rd., FAS 19 and 19-B, 764, Patrol 11038. CD 8/15—ENR 8/21.

E. I. du Pont de Nemours discussing the location of the first Du Pont powder mill with Thomas Jefferson, President of the United States, his friend and customer. From a painting by S. M. Arthurs.

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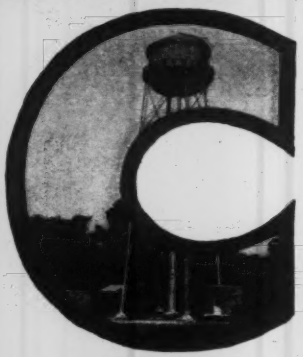

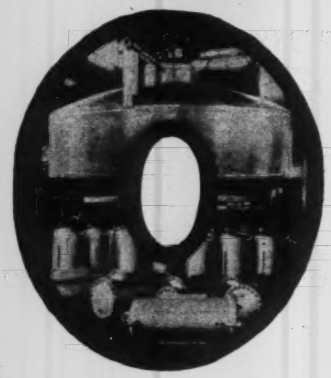

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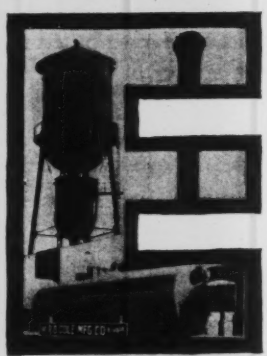

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STREETS, etc. (Low Bidders, Cont'd.)

New Hampshire—State Hy. Dpt., Concord, Aug. 28, imprv. 0.875 mi. Grafton Co., from Thomas W. Watkins & Son, Amesbury, Mass., **$29,712.** Est. $40,000. CD 8/13—ENR 8/21.

O., Canton — Repaving Tuscarawas St. W. from Harrison to Belleflower Aves., from General Asphalt Paving Co., Kahler Bldg. **$61,877.** Est. $66,436. J. A. Shisler, Canton, engr.

Oregon—State Hy. Comn., Salem, Sept. 4, imprv. 6.91 mi. Wasco Co., from M. Kuney, Hutton Bldg., Spokane, Wash. **$117,746*****10.4 mi. Jefferson Co., from Leonard & Slate, Multnomah, **$82,423*****4.07 mi. Jackson Co., from Norris Bros., Seattle, Wash., **$48,660.** Rejected bids Sept. 4, imprv. 3.5 mi. Lincoln Co.; furnishing crushed rock in stock piles, McKenzie Hy., Deschutes and Lane Counties. CD 8/27.

★**Pennsylvania** — State Hy. Dpt., I. L. Hughes, secy., Harrisburg, Sept. 5, imprv. 17,262 ft. hy., 2 concrete structures, 3 rein.-con. bridges, Tioga Co., from Ryan Bros., Inc., Westfield, **$303,104*****imprv. 18,246 ft. Tioga Co., from F. D. Kessler, Inc., Northumberland, **$261,273** *** 7,398 ft. Susquehanna Co., from Harvey & Flory, 321 N. Courtland St., East Stroudsburg, **$61,102*****18,519 ft. Northampton Co., from Edward H. Ellis, Inc., Westville, N. J., **$177,824*****10,815 ft. Mercer Co., from George S. Mellert-Weidner Co., Medina, O., **$150,499*****2,932 ft. Erie Co. and 11,138 ft. Erie Co., from Chas. H. Fry Constr. Co., 1902 Cherry St., Erie, **$35,041** and **$100,546** respectively***18,468 ft. Bedford Co., from E. M. Brown, 11 Gulich Ave., Clearfield, **$75,752.** CD 8/25—ENR 8/28.

★**Pennsylvania**—State Hy. Dpt., Harrisburg, Aug. 29, imprv. 1,599 ft. Westmoreland Co., from Eagle Constr. Co., 2339 5 Ave., McKeesport, **$86,670*****13,729 ft. Wayne Co., from H. B. Sproul Constr. Co., 222 W. Olive St., Scranton, **$78,856*****24,893 ft. Sullivan Co., from F. D. Kessler, Inc., Northumberland, **$341,678*****4,400 ft. Montgomery Co., from Dalton Bros., Inc., Paoli, **$52,793*****1,477 ft. Mercer Co., from Johnson & McIntyre, Sharon, **$49,917*****1,187 ft. Forest Co. from Clark Constr. Co., 117 Mary St., Johnsonburg, **$66,517** ***9,729 ft. Erie Co. and 27,811 ft. Crawford Co., from Galier Bros., 5713 Euclid Ave., Cleveland, O., **$103,103** and **$289,441** respectively***25,021 ft. Butler Co., from D. D. Mullett, 16 Brilliant Ave., Aspinwall, **$260,970***** 14,489 ft. Blair Co., from Putnam & Green, Inc., 206 Transfer St., Fort Wayne, Ind., **$115,-717*****2,340 ft. Allegheny Co., from McShane Constr. Co., 100 Baldwick Rd., Pittsburgh, **$77,877.** CD 8/21.

★**Pennsylvania**—State Dpt. Hys., Harrisburg, Sept. 5, imprv. 12,335 ft. hy., rein.-con. arch, 2 rein.-con. bridges, Indiana and Cambria Counties, from S. T. Brotemarhle Constr. Co., Box 393, Cumberland, Md., **$558,110.** CD 8/25—ENR 8/28.

★**Tennessee**—State Hy. Dpt., Nashville, Aug. 29, imprv. 0.747 mi. Campbell Co., from J. Ferris, Athens, **$39,982*****6.494 mi. Hamilton Co., from G. O. White, 1301 Market St., Chattanooga, and P. Smartt, 109 Morningside Dr., Chattanooga, **$319,799*****2.487 mi. Lincoln Co., from Weymouth Constr. Co., Box 363, Tullahoma, **$83,085*****6.373 mi. Rutherford Co., from T. M. Strider, Cotton States Bldg., Nashville, **$209,186*****9.921 mi. White Co., from B. G. Young, Jonesboro, **$206,227** ***4.723 mi. Rutherford Co., from Ziegler Constr. Co., 704 Amer. Bank Bldg., Nashville, **$127,735*****3.333 mi. Knox Co., from A. B. Burton Co., Roanoke, Va., **$221,740.** CD 8/21.

Texas—D. C. Greer, engr. State Hy. Dpt., Austin, Aug. 28, imprv. 5.945 mi. Bastrop Co., from T. E. Sandesfors, Belton, **$79,857** est. $80,000***17.274 mi. Leon Co., from J. W. Perry, 1225 W. Russell St., San Antonio, **$31,959** est. $32,000***12.336 mi. El Paso Co., from Austin Road Co., 1813 Clarence St., Dallas, **$268,960** est. $270,000***1.515 mi. Upshur Co., from H. L. Butler, 5219 Bradford Dr., Dallas, **$40,933** est. $41,000***7.273 mi. Limestone Co., from Cage Bros. & L. A. Turner, Bishop, **$82,268** est. $82,000***2.184 mi. Tarrant Co., from Texas Bitulithic Co., Box 5297, Dallas, **$174,906** est. $175,000***5.869 mi. Red River Co., from Ben Sira Co., 3901 Elm St., Dallas, **$42,174** est. $42,000***6.387 mi. Lee Co., from G. Kies, 1700 Pease Rd., Austin, **$39,572** est. $30,000. CD 8/20.

★**Texas**—D. C. Greer, engr. State Hy. Dpt., Austin, Aug. 29, imprv. 11.469 mi. Karnes Co., from E. Loyd, Box 1077, Fort Worth, **$97,406,** est. $88,860***0.287 mi. Tarrant Co., from Ben Sira & Co., 3901 Elm St., Dallas, **$134,306,** est. $119,027***7.847 mi. Callahan Co., from W. S. Crawford and T. M. Brown & Son, 4817 Montrose Dr., Dallas, **$108,370,** est. $101,653***14.262 mi. Galveston Co., from R. B. Smith, Inc., 2301 Southgate St., Houston, **$63,587*****13.346 mi. Polk Co., from Austin Road Co., 1813 Clarence St., Dallas, **$329,549,** est. $356,433***4.146 mi. Washington Co., from Cage Bros. and H. E. Williams, Bishop, **$91,958,** est. $85,756***8.863 mi. San Patricio Co., from Heldenfels Bros., Rockport, **$114,913,** est. $114,337. CD 8/20.

CONTRACTS AWARDED

†**Ariz., Fort Huachuca** — Con. Q.M., roads and walks, to White & Miller, Tucson, **$41,678.**

Ariz., Nogales—Street imprvs. **WPA. $155,-301.** G. M. Brannon, city engr.

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by John F. Stevens

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STREETS, etc. (Contracts Awarded, Cont'd.)

Ark., Arkadelphia—A. T. Goodfoe, mayor, repairing streets, sidewalks, **WPA. $72,420.**

Ark., Fayetteville — Arkansas University, sidewalks, surface drainage sys., curbing, campus roads, **WPA. $160,000.**

Ark., Hot Springs—E. T. Housely, judge Garland Co., imprv. roads, **WPA. $226,275.**

Ark., Lonoke—J. M. Malone, judge, Lonoke Co., imprv. roads, **WPA. $179,627.**

Calif., San Francisco—Owners, c/o contractor, grading, asphaltic concrete paving, vitr. sewers, 35 Ave. between Ortega and Pacheco Sts., to C. L. Harney, Call Bldg., **$35,400.**

Calif., San Bruno—Paving, sidewalks, sewers, watermains, El Crystal Subdivision, to L. C. Smith, 1 and Railroad Aves., San Mateo. **$54,363.** Bids 8/27. CD 8/23.

Calif., San Jose—Imprv. portions Snyder Ave., Clark and 7 Sts., to A. J. Reisch, 358 Lincoln Ave., **$32,006.** Bids 8/25. CD 8/21.

Ill., Evanston—Bituminous concrete surfacing to Barber Constr. Co., 7 S. Dearborn St., Chicago, Ill., **$104,760.**

Kansas—State Hy. Dpt., Osawatomie, imprv. 0.283 mi. FA 293 A, Part 1, and 2.594 mi. FA 293 A Part 2, Miami Co., to C. J. McCoy Constr. Co., 311 Union St., Emporia, **$28,217** and **$84,825** respectively***4.815 mi. FA 570-B and 4.913 mi. FA 570-C, Cherokee and Crawford Counties, to M. Haase, 2027 Swope Parkway, Kansas City, Mo., **$57,694** and **$56,747** respectively***2.594 mi. Miami Co., to Jones Constr. Co., 400 Elm St., Emporia, **$112,845.** Grand total **$340,328.** Bids 8/27, awarded 9/3. CD 8/12—ENR 8/14.

Kan., Kansas City—City, c/o T. B. Schlup, city engr., City Hall, concrete, asphaltic concrete paving 10 st. trafficway from Central to Walker Aves., to J. A. Tobin Constr., 3700 Rainbow Blvd., Kansas City, **$199,033.** Awarded 8/26.

Kentucky — Dpt. Roads, Frankfort, imprv. 1.392 mi. Richmond and McKee Rds., SP 33-83 and SP 33-63, Estill Co., to A. W. Walker & Son, Danville. **$32,363.** Bids 8/22. CD 8/4—ENR 8/7, under LB.

Maine—State Hy. Comn., L. D. Barrows, ch. engr., Augusta, imprv. 1.25 mi. hy., Lincoln, to Lane Constr Co., 35 Colony St., Meriden, Conn., **$70,068.** Bids 8/27. Rejected bids Aug. 27, imprv. hys. Hope and Monroe. CD 8/21.

†Md, Aberdeen Proving Ground—Con. Q.M., sidewalks, to Southern Eng. Co., 1426 Philpot St., Baltimore, **$34,888.**

†Mass., Falmouth—Con. Q.M., access roads, etc., Camp Edwards, to B. Perini & Sons, Inc., Montwait Ave., Framingham, **$354,501.**

Minnesota—State Hy. Dpt., St. Paul, imprv. 2.8 mi. S.P. 2203-05 (Trunk Hy 22-87), to W. Deef, Waseca, **$32,488.** Bids 8/22. CD 8/6—ENR 8/14.

Nev., Reno—Paving 1,410,000 sq. ft. street and alley bituminous plantmix, 284,000 sq. ft. alley and street intersections, to Union Paving Co., 310 California St., San Francisco, Calif., **$203,430.** CD 8/26—ENR 8/28.

N. J., Bloomfield—Imprv. 23,000 sq.yd. Glenwood Ave. and Prospect St., to Franklin Contg. Co., 24 Washington Pl., Newark, **$11,245.** Bids 9/2. CD 8/28.

N. J., Dunellen—Boro, Boro Hall, 8 in. concrete paving, Prospect Ave., to Road Contg. Co., 714 Central Ave., Westfield, **$25,000.** Bids 8/18. CD 8/15.

†N. J., Fort Hancock (Highlands)—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., grading, paving roads Fort Hancock, **WPA. $55,500.**

N. J., Kearny—Imprv. 11,030 sq.yd. Hackensack Ave. and 3 St., to Joseph P. Nesto & Co. 872 Bway., Newark, **$25,398.** Bids 9/3. CD 8/21—ENR 8/25.

N. J., Montclair—Grading, paving, curbing, storm drains Claremont Ave., Sect. 2, to Marscellis Warner Corp., 10 Baldwin St., **$29,320.** CD 8/18.

New Mexico—B. G. Dwyre, engr. State Hy. Dpt., Santa Fe, imprv. 12.168 mi. Grant Co., to Skousen Bros., Albuquerque, **$96,581***** 0.568 mi. FAGM 96 (3) and 2.839 mi. FAP 96 (4), De Baca Co., and 6.708 mi. Colfax Co., to Henry Thygesen & Co., Albuquerque, **$99,809** and **$51,381** respectively. Grand total $247,771. Bids 9/5, awarded 9/5. CD 8/27.

N. Y., Highland — Village, reconstructing Tillson, Washington and Lynwood Aves. **WPA. $50,000.**

N. Y., Jamestown—Dpt. P. Wks., City Hall, blacktop paving Baker St. exten., Market, 8 and 4 Sts., Forest, McDannel and Prendergast Aves., own forces. **$25,000.** C. J. Strandburg, city engr.

†N. Y., Pine Camp—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., basing, paving, etc. 7.6 mi. roads. **WPA. $56,470.**

Ohio—State Hy Dpt., Columbus, imprv. 4.776 mi. Tuscarawas Co., to Max J. Zeller, Inc., 595 W. Goodale St., Columbus, **$55,380** est. $55,600***2.328 mi. Summit Co. and 9.114 mi.

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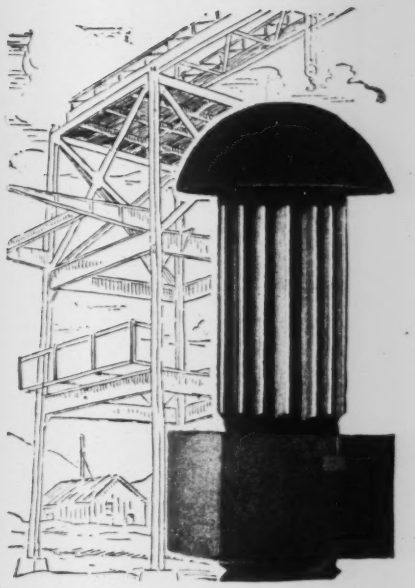

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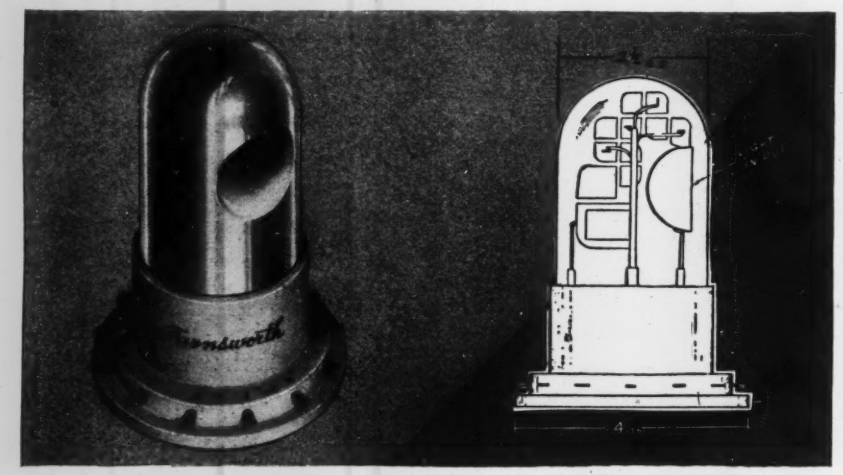

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STREETS, etc. (Contracts Awarded, Bonds Holmes Co., to Ohio Road Imprvt. Co., Chamber of Commerce Bldg., Columbus, $82,813 and **$50,538** respectively, est. $39,300 and $52,300 respectively•••5.527 mi. Fulton to S. E. Johnson Co., 218 Terminal Bldg., Toledo, **$128,872** est. $129,300•••2.721 mi. Clark Co. to Boyd & Cook Co., Gas & Electric Bldg., Dayton, **$65,477** est. $65,550. Grand total $333,080. Bids 8/26. State Hy. Dpt. received no bids Aug. 26, imprv. 5.03 mi. Vinton Co., 1.041 mi. Preble Co.; 0.198 mi. Ashtabula Co., 2.332 mi. Adams Co. CD 8/14—ENR 9/4.

O., North Randall—Cuyahoga Co., Cleveland, imprv. section Emery Rd., to Ideal Concrete Co., 3455 E. 123 St., Cleveland, **$40,183.** J. G. McWilliams, Cleveland, co. engr.

O., St. Clairsville—Bd. Comrs., Belmont Co., resurfacing 1.6 mi. Sect. A., Cheermont Rd., Colerian Twp., to Tri-State Asphalt Corp., South Broadway, Martins Ferry, **$34,913.** Est. $40,000. Bids 8/21. G. C. Travis, co. engr.

Pennsylvania—State Hy. Dpt., I. L. Hughes, secy., Harrisburg, imprv. 24.42 mi. hys. Blair, Cambria, Fayette, Schuylkill, Somerset and Washington Counties. **WPA. $323,443.** T. C. Frame, c/o owner, ch. engr.

Pa., Albion—Boro Council, concrete curbs, gutters, blacktop on stone surfacing, own forces. **$25,000.** V. E. Best, supt. Streets.

Pa., Dunmore (Scranton, Pa.)—Boro Council, J. Haggerty, chn., 14,370 lin. ft. concrete sidewalks, **WPA. $62,600.** S. Mastrianni, boro engr.

†Tex., Brownsville—Con. Q.M. Fort Brown, grading, draining, leveling, etc. grounds and facilities imprvs., **WPA. $52,535.**

†Tex., Brownwood—Con. Q.M., Camp Bowie, 50 mi. roads in vicinity Camp Bowie, to Allhands & Briley, Inc., and Allhands & Swarzell, Inc., Southwestern Life Bldg., Dallas. **$111,448.** Bids 8/18. CD 8/11.

Tex., Caldwell—Burleson Co., c/o Judge, Caldwell, reconstructing, imprv. roads. **WPA. $59,730.**

†Tex., Camp Barkley—Con. Q.M., 7.2 mi. roads, etc. to General Constr Co. Magnolia and H. & T. C. Ry., Fort Worth. **$91,949.**

Tex., Houston—Harris Co., c/o Judge, Court House, imprv. Sylvan Beach Rd., to W. E. Worthen, 7102 N. St., **$30,581;** Market St. and widening Goose Creek bridge, to W. F. Warfield & Co., 2701 Texas St., Bellaire, **$66,999.** Bids 8/22. CD 8/20.

†Tex., Marfa—Con. Q.M., Fort D. A. Russell, additional ground imprvs., grading, leveling, draining, etc. **WPA. $50,595.**

†Tex., San Antonio—Con. Q.M., Fort Sam Houston, bituminous paving warehouse area, San Antonio General Depot, to H. B. Zachry Builders Exch. **$82,000.** Bids 8/26. CD 8/21.

Tex., Shiner—Street paving, imprvs., **WPA. $66,915.**

†Utah, Ogden—Con. Q.M., Utah General Depot, additional street paving, curbing, guttering army supply depot, to Ora Bundy, 226 Kiesel Bldg. **$81,759.**

†Utah, Ogden—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., access road from Hill Field to U. S. Hy. 89, to W. W. Clyde & Co., Springville. **$44,850.** Bids 8/6.

Wash., Prosser — Grading, ballasting 5 blocks; grading, graveling 6 mi. alleys; curbs, sidewalks, imprv. flood drains, etc. **WPA. $71,000.**

Wyo., Rock Springs—W. A. Muir, mayor, street imprvs. **WPA. $137,443.**

EARTHWORK, WATERWAYS

PROPOSED WORK

†Del., Reedy Point—U. S. Eng., 900 Customhouse, 2 and Chestnut Sts., Phila., Pa., placing 27,000 tons rubble stone to form exten. to northern one of 2 existing stone jetties in Delaware River, Chesapeake and Delaware Canal.

★**Ia., Moscow** — First Iowa Hydro-Electric Co-op., Muscatine, dam, generating plant, Cedar River, at Moscow. $13,500,000. Burns & McDonnell, Kansas City, Mo., engrs. CD 6/11—ENR 6/26, under Muscatine.

†Neb., Winnebago—U. S. Eng., 1709 Jackson St., Omaha, Neb., excavating 164,000 yd. earth from channel Missouri River to form pilot canal, Browers Bends, $16,400.

O., Chillicothe—Ohio Dpt. Conservation, State Office Bldg., Columbus, D. Waters, dir., dam near Yellowbud, forming artificial lake, levee. $80,000.

†Tex., Brownsville—Con. Q.M., exten. drainage, grading, filling-in program, Military area, Fort Brown. $290,000. Applied for WPA funds.

★**Tex., El Paso**—El Paso Co. Water Control & Imprvt. Dist. 1, c/o M. Scarbrough, 405 Caples Bldg., water control and imprvt. work, ditching, drainage, levees. $700,000. Bond election soon. Frazer & Benner, 705 El Paso Natl. Bank Bldg., engrs.

★**†Tex., Houston** — Bond election Sept. 27, dredging for flood control. $800,000. J. G. Turney, city engr.

BIDS ASKED

Bids Asked September 17

†D. C., Wash.—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., dredging 1,000,000 cu. yd. material, place measurement, from

EARTHWORK, etc. (Bids Asked, Cont'd.)

Potomac River near Maryland Point, about 45 mi. below here; adv. ENR 9/11.

†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, 12,448 ft. revetment in Missouri River between Papillion and Nishnabotna; 15,314 lin. ft. revetment in Missouri River between Snyder and Louisville Bend; 8,970 lin. ft. revetment in Missouri River between Peru and Rulo Bends.

Bids Asked September 18

†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, 8,000 ft. revetment in Missouri River between Sioux City and Winnebago Bends, center of work about 7 mi. from Homer. $175,000.

†**Washington**—Bureau Reclamation, Customhouse, Denver, Colo., furnishing, del. fabricated structural steel for transformer tie-down portal frames for Units L-4, L-5 and L-9, Grand Coulee power plant, Columbia Basin Project, Spec. 1562-D.

Bids Asked September 22

†**California** — Bureau Reclamation, Sacramento, additional 6¾ mi. Contra Costa Canal from Walnut Creek to Pacheco, Central Valley Project.

Bids Asked September 23

†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, 6,190 lin. ft. standard dikes and 6,502 lin. ft. revetment in Missouri River at Louisville-Blair Bends.

South Carolina—South Carolina Pub. Serv. Auth., transmission lines connecting, Santee-Cooper Proj. switchyard with Bowman, S. C., Berkeley and Orangeburg Counties. Harza Eng. Co., 27 Cumberland St., Charleston, engrs.

Bids Asked September 24

†**California** — Bureau Reclamation, Customhouse, Denver, Colo., furnishing, del. eighteen 102 in. conduit tube valves for river outlets at Shasta Dam, Central Valley Project, Spec. 991; adv. ENR 9/11.

La., Crowley—Sixth Ward & Crowley Drainage Dist., L. A. Williams, secy., dredging, redredging Drains C and H. Extended date. CD 9/4—ENR 9/4.

Bids Asked September 26

†**Oregon**—U. S. Eng., Pittock Blk., Portland, Ore., dredging, disposing 2,353,000 cu. yd. material and furnishing, placing 28,600 cu. yd. rip rap to complete forebay and tailrace, Bonneville powerhouse, Inv. 698-42-32.

Bids Asked September 29

†**California** — Bureau Reclamation, Customhouse, Denver, Colo., furnishing, del. three 25,000 kva. unity power factor, vertical shaft, alternating current generators for Keswick power plant, Kennett Div., Central Valley Project, Spec. 992; adv. ENR 9/11.

Bids Asked September 30

Calif., Merced—Merced Irrigation Dist., outlet works, rein.-con. outlet structure, 275 lin. ft. concrete lined canal and rein.-con. headgate, Fahrens Creek, near Planada; rein.-con. combination flood and irrigation structure, Black Rascal Creek, at Crocker Dam, 2½ mi. north of here. CD 10/9/40—ENR 10/17/40.

Bids Asked October 3

†**Pennsylvania**—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., pump. station, etc., also 250,000 cu. yd. earth fill levee and channel changes in Hanover Twp., Luzerne Co.; adv. ENR 9/11.

†**Pa., Hanover**—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., Solomon Creek Pump. Station for flood control, Luzerne Co. CD 9/2—ENR 9/4.

Bids Asked October 6

†**New York**—U. S. Eng., 17 Battery Pl., New York, 2,832,500 cu. yd. place measurement of all material except ledge rock from Liberty Island Anchorage; adv. ENR 9/11.

LOW BIDDERS

★†**California**—Bureau Reclamation, Old Post Office Bldg., Sacramento, Aug 27, clearing brush and timber from 15 tracts in Shasta Reservoir site, Central Valley Project, Spec. 977, from E. L. Gates, Portland, Ore. **$1,740,000.** CD 8/4—ENR 8/7.

†**California**—Bureau Reclamation, Old Post Office Bldg., Sacramento, Aug. 29, station facilities and water supply and sewerage sys. for Southern Pacific R.R. relocation, Kennett Div. Central Valley Project, Spec. 373, from Scheumann & Johnson, Box 822, Eureka, **$100,088.** CD 8/4—ENR 8/14.

†**Ind., Evansville**—U. S. Eng., P. O. Box 59, Louisville, Ky., Aug. 29, flood protection works, Howell Sect., Unit 1, from Ryan Constr. Corp., 402 Court Bldg., **$263,697.** CD 7/29—ENR 7/31.

†**Missouri**—U. S. Eng., 601 Davidson Bldg., Kansas City, Sept. 2, 4,920 ft. dikes, 720 ft. rock dikes and 5,550 ft. revetment in channel Missouri River between Rocheport and Dundee Reaches, 12 mi. from Jefferson City, from Bilhorn, Bower & Paters, Inc., 8015 Forsythe Blvd., Clayton, **$243,345.** Est. $267,453. CD 8/15—ENR 8/21.

†**Missouri**—U. S. Eng., 601 Davidson Bldg., Kansas City, 3,950 ft. pile dikes and 4,730 ft. revetment in Missouri River between Rulo and Quindaro Bends, about 10 mi. downstream

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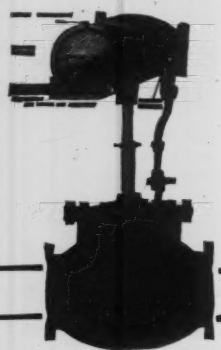

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EARTHWORK, etc. (Low Bidders, Cont'd.)

from St. Joseph, from James Constr. Co., 89 E. 5 St., Minneapolis, Minn. **$202,682.** Est. $198,543. CD 8/20—ENR 8/28, under Nebraska.

†Mo., Lexington—U. S. Eng., 601 Davidson Bldg., Kansas City, Aug. 29, 4,850 ft. dikes and 5,880 ft. revetment in Missouri River between Quindaro and Malta Bends, 9 mi. from here, from W. P. McGeorge, Box 995, Pine Bluff, Ark., **$232,490.** Est. $224,053. CD 8/14—ENR 8/21.

†Ore., Bonneville—U. S. Eng., Pittock Blk., Portland, Aug. 39, furnishing twelve 115-kv. oil circuit breakers, etc. for Bonneville Dam powerhouse, Inv. 698-42-55, from Westinghouse Electric & Mfg. Co., Union Bank Bldg., Pittsburgh, Pa., **$191,748.** CD 8/5—ENR 8/7.

South Carolina—South Carolina Pub. Serv. Auth., finishing work, Pinopolis powerhouse, Santee-Cooper proj., from The Howard P. Foley Co., 108 E. Read St., Baltimore, Md., **$262,920.** Harza Eng. Co., 27 Cumberland St., Charleston, engrs.

†Wisconsin—U. S. Eng., 408 Federal Bldg., Milwaukee, Sept. 3, dredging channel through Sturgeon Bay, from Union Constr. Co., 711 Old Colony Bldg., Des Moines, Ia. **$124,400.** CD 8/4—ENR 8/7.

CONTRACTS AWARDED

†Arkansas—U. S. Eng., P. O. Box 97, Memphis, Tenn., earthen levees, Hopedale Levee Setback, South Bank Arkansas River, Desha Co., to J. W. Hendrix, Hunter Bldg., Shreveport, La., **$77,220** and to C. T. Watts, Effingham, Ill., **$85,278.**

†Calif., San Francisco—U. S. Eng., 401 Customhouse, dredging 98,179 cu. yd. San Francisco Bay, to Bundeson & Lauritzen, Pittsburg, **$16,690.**

†Delaware—U. S. Eng., 2 and Chestnut Sts., Phila., Pa., 2 steel sheet pile bulkheads, Indiana River Inlet, to Short & Shockley, Bethany Beach, **$70,470.**

★**†Georgia**—Tennessee Valley Auth., Knoxville, Tenn., constructing 2 mi. tunnel, Ocoee No. 3 hydro-electric project, to J. F. Shea, Inc., & Morrison-Knudsen Co., Sylva, N. C. **$1,640,215.** CD 7/22—ENR 7/24, under CA.

Pa., Pittsburgh—Bd. Co. Comrs., Allegheny Co., Contr. 12, electric work, river front imprvs., Duquesne Way, to Raphael Electric & Engr. Co. 910 Penn Ave. **$30,875.** Bids 7/22.

★**Utah, Newton**—Newton Water Users Assn., J. J. Larsen, secy., earth and rockfill dam to impound 1 5,200 acre ft. water for irrigation purposes, **WPA. $700,000.** I. D. Jerman, Logan, U. S. Bureau Reclamation engr.

N. S., Halifax—Dpt. Transport, Ottawa, Ont., breakwater repairs to present breakwaters, rein.-con. lighthouse tower, Mangers Beach, Halifax Harbour, to J. P. Kelly, 28 Kent St., **$23,000.**

Ont., Oshawa—Dpt. P. Wks., Ottawa, dredging harbor, to C. S. Boone Dredging & Constr. Co., Ltd., 80 Richmond St. W., Toronto, **$18,810.** K. M. Cameron, c/o owner, engr.

UNCLASSIFIED

PROPOSED WORK

†Calif., Lemoore—AIR FIELD—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., air field incl. utilities, etc. F. S. Currie, San Bernardino, archt. and engr. CD 6/16—ENR 7/3.

Calif., Wasco—SWIMMING POOL—Wasco Union High School Dist., plans by Franklin & Kump, 201 Sill Bldg., Bakersfield, swimming pool. $46,000. CD 8/27—ENR 9/4.

Ia., Cedar Rapids — GOLF COURSE — E. Stefan, park comr. 18 hole golf course, Ellis Park. $50,000. $40,000 bond election Sept. 18.

Ia., Des Moines—HANGAR—Hangar, Municipal Airport. **$25,000.**

Ia., Washington—SWIMMING POOL—Bond election Sept. 24, swimming pool. $28,000. CD 8/26—ENR 8/28.

Me., Augusta—AIRPORT—U. S. Eng., Park Square Bldg., Boston, Mass., widening pavement N/S runway to 150x3,400 ft. and paving E/W landing strip 150x2,800 ft. $100,000. CAA.

Me., Bar Harbor—AIRPORT—U. S. Eng., Park Square Bldg., Boston, Mass., surveys 500x4,000 ft. NE/SW landing strip and 500x4,000 ft. N/S landing strip, etc. $295,000. CAA.

Me., Fort Kent—AIRPORT—U. S. Eng., Park Square Bldg., Boston, Mass., 500x4,000 ft. NE/SW and SE/NW landing strips paving. $390,000. CAA.

Me., Greenville—AIRPORT—U. S. Eng., Park Square Bldg., Boston, Mass., two 500x3,000 ft. NE/SW and E/W landing strips, paving, etc. $180,000. CAA.

Me., Oldtown—AIRPORT—U. S. Eng., Park Square Bldg., Boston, Mass., exten. NE/SW and NW/SE landing courses to 500x4,000 ft., paving. $300,000. CAA.

Me., Winterport—AIRPORT—U. S. Eng., Park Square Bldg., Boston, Mass., two 500x 4,000 ft. N/W and E/W airplane landing courses. **$395,000.** CAA.

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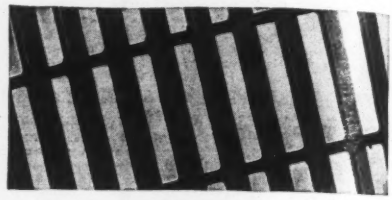

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UNCLASSIFIED (Proposed Work, Cont'd.)

Michigan—GENERATING FACILITIES—Fruit Belt Electric Co-operative, R. Thompson, mgr., Cassopolis, additional generating facilities. $125,000 REA allot.

Nebraska—POWER LINE—Consumers Pub. Power Dist., Columbus, rebuilding 20 mi. power line between Ainsworth and Bassett, constructing 35 mi. new line between Ainsworth and Valentine. $35,000.

Neb., North Platte—SWIMMING POOL—S. V. Throckmorton, city clk., plans $25,000 bond election swimming pool, etc. $60,000.

N. H., Claremont—AIR FIELD—Town, Bd. Selectmen, Town Hall, extending E/W and NE/SW landing strips to 500x3,000 ft. paving runways. $200,000. CAA. F. A. Coleman, WPA dir. of operations, Manchester.

†**N. H., Concord**—AIRPORT—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., airport Class 3, exten. includes, constructing runways 500x4000 ft. NE/SW paved 150 ft. wide. exten. NW/SE strip 1, 500 ft. E/W landing strip exten. 1100 ft., basic lighting, etc. $379,000.

†**N. H., Keene**—AIR FIELD—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., air field, Class 3, N/S and NE/SW runways each 500x4,000 ft. paved strips 100 ft. wide, North Swansey Sect. $445,000.

†**N. H., Whitefield**—AIR FIELD—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., air field Class 3, N/S and NE/SW strips, 500x4000 ft. with paved strip 100 ft. wide. $405,000.

O., Geneva—STADIUM—Bd. Educ. and Village of Geneva, rein.-con. stadium, N. Broadway and North Ave. $25,000. W. R. Gray Eng. Co., 16 S. St. Clair St., Painesville, engr.

O., Mansfield—AIRPORT—Bond election, municipal airport imprvs. $280,000. W. C. Statler, city engr.

†**Ore., La Grande**—AIR REPAIR BASE—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., major air repair base.

Pa., Johnstown — TROLLEY RAIL REMOVAL—Johnstown Street Railway Co., Johnstown, trolley rail removal from Oakhurst line and in South Cambria St., repaving afterwards. $25,000-$40,000.

Pa., Scranton—CLIFF REMOVAL—Dpt. P. Wks., W. Schunk, dir. City Hall, removing Cliff, Putnam St. area. $30,942. F. K. Derby, city engr.

★**Tex., Houston**—AIRPORT—Bond election Sept. 27, hangars, administration buildings, taxi strips. $800,000. J. G. Turney, city engr. CD 7/1—ENR 7/10.

Tex., Houston—PARK—Speer's Amusement Park, c/o S. L. Speer, Main St., developing adjoining 5 acre tract, incl. rein.-con. swimming pool, etc. for amusement park. $80,000.

Tex., Mesquite—RANCH DEVELOPMENT—W. P. Luse, Magnolia Bldg., Dallas, developing 1,400 acre ranch, several earthen lakes. $50,000.

†**Tex., Midland**—AIRPORT—U. S. Eng., Denison, airport imprvs., primarily ground imprvs. for operation Flying School. $245,000.

Tex., Palestine—NATURAL GAS SUPPLY—Palestine Gas Co., c/o J. B. Daniels, Palestine, 25 mi. 10 in. pipe main from Red Lake area, Freestone Co. to city limits. $60,000.

Tex., Waco—AIRPORT—McClellan Co., c/o Judge, voted $150,000 bonds, airport development, 1,168 acre site. CD 8/27.

Utah, Ogden—AIRPORT IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., administration building, municipal airport. $50,000.

Utah, Ogden—SKI LIFT—J. C. Brown, city engr., 120 chair ski lift on Mt. Ogden Ski Hill in Snow Basin.

Vt., Coventry—AIRPORT—Town Bd. Selectmen, Town Hall, 500x4,000 ft. N/S and NE/SW landing strips, paving, etc. $295,000. Army Eng. Corps, Whitehall Bldg., New York, N. Y., engrs.

Vt., Rutland—AIRPORT—Mayor's Office, 500x4,000 ft. N/S and E/W runways, paving, $425,000. CAA: Army Engineers, Whitehall Bldg., New York, N. Y., engrs.

†**Wash., Grand Coulee** — TRANSFORMER DECK—Bureau Reclamation, Grand Coulee, 45x58x755 ft. transformer deck, site proposed east powerhouse at Coulee Dam. $300,000.

★**Wash., Seattle** — SUBSTATIONS—Enlarging Columbia, Magnolia, Third Ave. and South Substations, increasing capacity Ballard-North Substation tie line. $928,000. E. R. Hoffmam, City Light Bldg., City Light supt.

★**Wash., Spokane**—AIRPORT—Super-airport, Class IV type, $1,000,000. CAA. A. D. Butler, city hall, engr.

BIDS ASKED

Bids Asked September 16

N. Y., New York—PARK IMPROVEMENT—Comr. Parks, office Dpt. Parks, Arsenal Bldg., 64 St. and 5 Ave., Central Park, reconstructing park area along East River Dr. between E. 49 and E. 51 Sts., Contr. M-108-141.

N. Y., New York—TUNNELS—At office New York City Tunnel Auth., A. Jones, chn., 200 Madison Ave., Manhattan Tunnels, Brooklyn-Battery tunnel. Extended date. CD 7/29—ENR 7/31.

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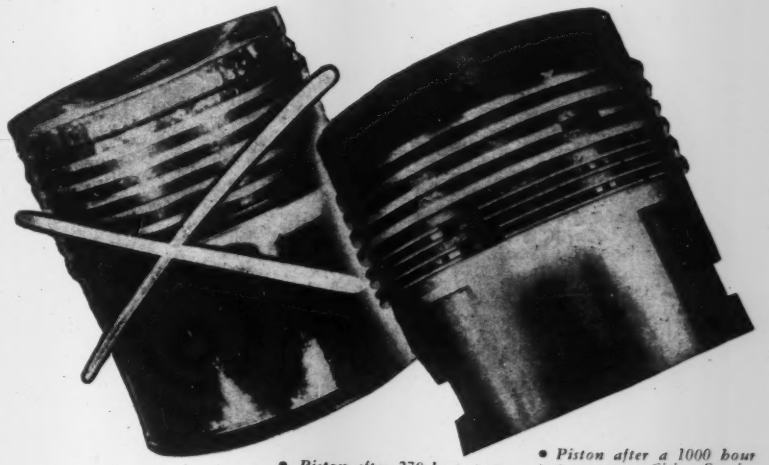

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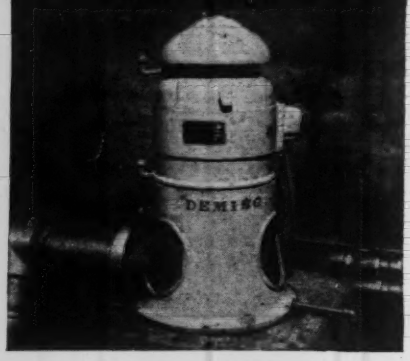

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UNCLASSIFIED (Bids Asked, Cont'd.)

Bids Asked September 18

Texas—RURAL ELECTRIC LINES—New Era Electric Co-operative, Inc., Mrs. Eunice Bailey, pres., Athens, 310 mi. rural electric lines, Henderson, Anderson, Freestone, Smith and Van Zandt Counties. **$246,000.** Beavers, Ladal & Wells, Smith-Young Tower, San Antonio, engrs. CD 8/7—ENR 8/14.

†**Wash., Neah Bay**—STEEL TOWER ANTENNA SYSTEM—Civil Aeronautics Admin., Commerce Bldg., Wash., D. C., steel tower antenna sys. and radio facility, near here; adv. ENR 9/11.

Bids Asked after September 19

Kansas—TRANSMISSION LINES—Nemaha-Marshall Electric Co-op., Axtell, 229 mi. transmission lines. $163,000. Paulett & Wilson, 1006 Kansas Ave., Topeka, engrs. CD 7/16—ENR 7/24.

N. Y., Brooklyn—ELEVATED RAILROAD REMOVAL—Bd. Transportation, 250 Hudson St., New York, removal, disposal Fulton St. elevated railroad structure from East River to Myrtle Ave. and from Lafayette to Rockaway Aves., Agreement QO.

†**North Dakota** and **Iowa**—LOOP ANTENNA SYSTEM, etc.—Civil Aeronautics Admin., Commerce Bldg., Wash., D. C., loop antenna sys. and radio facility building, near Minot, N. D., and Ottumwa, Ia.

Ore., Portland—AIRPORT—U. S. Eng., 628 Pittock Blk., Portland, commissary bldg., Portland-Columbia Airport, Inv. 698-42-142.

Bids Asked September 22

Del., Wilmington—AIRPORT—U. S. Eng., 900 Customhouse, 2 and Chestnut Sts., Phila., Pa., drainage, paving for 3 runways and 3 taxiways, New Castle Co. airport near here. Inv. 697-42-106.

Texas—RURAL ELECTRIC LINES—Hill Co. Electric Co-operative, Inc., c/o E. P. H. Farrow, Itasca, 54 mi. rural electric lines, poles, Dallas, Ellis, Hill and McLennan Counties. $38,000. Freese & Nichols, Capps Bldg., Fort Worth, engrs. CD 7/31—ENR 8/7.

Bids Asked September 24

†**Ill., Chanute Field (Rantoul)**—SPORTS ARENA—U. S. Eng., P. O. Box 59, Louisville, sports arena; adv. ENR 9/11.

★†**Wash., Keyport**—Puget Sound Navy Yard, Bremerton, 124x300 ft. machine shop addn. and 61x121 ft. rein.-con. fdry. and pattern shop, Naval Torpedo Station, Spec. 10602. $500,000.

Bids Asked After September 27

Kansas—TRANSMISSION LINES—Co-operative Power & Light Co., Iola, 225 mi. transmission lines. $207,000 REA allot. Paulette & Wilson, 1006 Kansas St., Topeka, engrs. CD 8/5—ENR 8/7.

Bids Asked

Ont., Windsor—SUB-STATION—Municipality, c/o P. Utilities Comn., Canada Bldg., sub-station. $141,000. D. J. Cameron, Bartlett Bldg., archt.

LOW BIDDERS

Calif., Glendale — OIL TANK, etc. — City, Aug. 28, concrete oil tank and cooling tower reservoir, from F. H. Strohecker Co., 1738 W. 49 St., Los Angeles. **$39,900.** J. C. Albers, City Hall, engr.

N. Y., New York—RACK, etc.—Office Dpt. Parks, Arsenal Bldg., 64 St. and 5 Ave., Central Park, Sept. 5, rack, ramp, etc., Sound View Park, Bronx Boro, from Melwood Constr. Co., 507 5 Ave., **$35,865.** CD 8/28.

S. C., Clemson—STADIUM—Clemson College, Sept. 4, athletic stadium, from C. Y. Thomason Co., Greenwood. **$109,315.**

★†**Washington** — CONDUCTOR — Bonneville Power Admin., P. O. Box 3537, Portland, Ore., Sept. 2, 527,000 ft. conductor etc. for Midway-Coulee section of Bonneville-Grand Coulee 230 KV line No. 2 Inv. 2192, from General Cable Corp., 420 Lexington Ave., New York, N. Y. **$521,050.** CD 8/21.

†**Washington**—TRANSMISSION LINE INSULATOR UNITS—Bonneville Power Administration, P. O. Box 3537, Portland, Ore., Aug. 27, furnishing 160,000 insulator units for transmission lines, del. at Walla Walla, North Bonneville, Goldendale, Granger, and Ampere, Inv. 2158, from Westinghouse Electric & Mfg. Co., Union Bank Bldg., Pittsburgh, Pa. **$299,600.** CD 8/13.

†**Wash., Seattle**—APRON SURFACE—Con. Q.M., 1519 S. Alaskan Way, complete surface on aprons adjacent to and deck inside pier shed of Pier A, Inv. Q.M. 7212-42-2, from Lauch Bros., 233 Ninth Ave. N. **$35,833.**

★†**Wash., Seattle**—PIER—Con. Q.M., Sept. 5, pier, Q.M. Depot, Spec. Q.M. 7212-42-1, from General Constr. Co., 3840 Iowa St. **$1,944,000.** CD 9/2.

†**Alaska, Anchorage**—GASOLINE FUELING SYSTEM—U. S. Eng., Central Bldg., Seattle, Wash., Sept. 5, Air Corps gasoline fueling sys., Elemendorf Field, Inv. 869-42-67, from Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y. **$298,344.** Est. $321,900. CD 8/28—ENR 9/4.

CONTRACTS AWARDED

†**Calif., Camp Roberts**—HARD STANDING AREA—Con. Q.M., constructing hard standing area, to N. M. Ball & Sons, Pasadena, **$142,450.** Awarded 8/8.

★†**Calif., Richmond**—SHIP WAYS—United States Maritime Comn., 14 St. between E St. and Constitution Ave. N.W., Wash., D. C., 3 ship ways, incl. shops, equipment, machinery, to Richmond Shipbuilding Corp., Richmond **$3,000,000.**

†**Del., Wilmington**—AIRPORT IMPROVEMENTS—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., removing structures, grading, topsoiling, New Castle Co. airport, to Daugherty Constr. Corp., Elkton, Md. **$212,045.**

†**Ga., Savannah** — GASOLINE FUELING SYSTEM—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., gasoline fueling sys., Air Base, to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y., **$245,861.**

Louisiana, Alabama and Florida — GAS PIPELINE—United Gas Pipe Line Co., 1515 Fairfield Ave., Shreveport, La., 200 mi. natural gas pipeline, vicinity Mandeville, La., to Pensacola, Fla., force account, **$300,000.** CD 8/22—ENR 8/28, under Mandeville, La.

†**Me., Houlton**—GASOLINE DISTRIBUTION SYSTEM—U. S. Eng., Park Sq. Bldg., Boston, Mass., gasoline distr. sys., Army Air Base, to Ley Constr. Co., 1215 Main St., Springfield, Mass., **$92,242.**

†**Me., Houlton** — PARKING AREA — War Dpt., Park Sq. Bldg., Boston, Mass., parking area, Army Air Corps, to B. Perini & Sons, Montwait Ave., Framingham, Mass. **$425,825.**

★†**Me., Presque Isle**—AIRPORT IMPROVEMENTS—U. S. Eng., Park Sq. Bldg., Boston, Mass., constructing roads, draining, water, electric and sewerage sys., Army Air Corps Field, to Bridge Constr. Co., 335 Water St., Augusta, **$459,150;** gasoline distr. sys., to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y., **$114,707.**

†**Me., Presque Isle**—SUB-STATION—U. S. Eng., Park Sq. Bldg., Boston, Mass., power sub-station, Air Base, to General Electric Co., 140 Federal St., Boston, Mass. **$30,812.**

†**Massachusetts**—SUBMARINE LINE — Con. Q.M., Harbor Defenses, Army Base, Boston, Aug. 29, 5,200 ft. 10 in. submarine line from Windmill Point, Pemberton to Fort Warren, and 1,600 ft. 10 in. line across Fort Warren, from V. Barletta Co., 10 Whipple Ave., Roslindale. **$193,350.** CD 8/26.

★**Michigan**—DAMS, etc.—Wisconsin-Michigan Power Co., 112 E. College Ave., Appleton, 2 dams, power house, 2 transmission lines, Peavy Falls dam on Michigamme River to C. R. Meyer & Sons Co., 50 State St., Oshkosh, Wis., tunnel excav, tunnel concrete lining, clearing site, to Bacco Constr. Co., Iron Mountain. Total est. **$1,250,000.** CD 5/13—ENR 5/15.

Minn., Minneapolis—ATHLETIC FIELDS—Bd. Educ., 305 City Hall, athletic fields, Southwest and Henry High Schools, imprv. playgrounds, 3 grade schools. **WPA.** **$117,404.**

†**Miss., Meridian** — AIRPORT IMPROVEMENTS—C. Vinson, mayor, imprv. Topton Field airport, **WPA.** **$213,000.**

†**N. J., Lakehurst**—NAVAL AIR STATION—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Naval Air Station imprvs., pulling stumps, excavating, grubbing, filling, grading, draining, fencing, bridges, roads, etc., **WPA.** **$114,159.**

★†**N. Y., Hempstead**—AIRPORT—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., armament and instrument inspection and adjustment bldg., Mitchel Field, to Industrial Eng. Co., 50 Church St., New York, **$121,386;** runway, to Hughes-Kelly Corp., 99 E 2 St., Mineola, **$495,199.** CD 5/7—ENR 5/15.

†**N. C., Charlotte**—AIRPORT—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., increasing width runways, etc., to Goode Constr. Corp., Builders Bldg., and Blythe Bros., 424 S. Brevard St., Charlotte, **$232,485.** CD 5/7—ENR 5/15.

†**N. C., Fort Bragg**—GASOLINE FUELING SYSTEM—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., gasoline fueling sys., Pope Field, to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y., **$41,011.** CD 7/25.

O., Dayton—AIRPORT IMPROVEMENTS—Municipal airport imprvs., **WPA.** **$300,000.** F. O. Eichelberger, Dayton, city mgr. J. F. Hale, city engr.

★†**O., Dayton** — RUNWAYS — U. S. Eng., Wright Field, 3 concrete runways, grading, draining, to Price Bros. Co., 1932 E. Monument Ave. **$1,560,000.** CD 6/17—ENR 6/19.

Okla., Chickasha — AIRPORT — Bonfils & Wilson, c/o B. Hoyt, archt., Colorado Natl. Bank Bldg., Denver, Colo., airport and flying school, hangar, runway, etc. to Johnson-Wilkinson Co., Duncan, Est. **$100,000.**

†**Ore., Pendleton**—AIRPORT PUMPHOUSE—U. S. Eng., Pittock Blk., Portland, gasoline unloading facilities, pumpline, pumphouse, etc., Army Airbase, to Eugene Ruedy Co., 7909 N.E. Halsey St., Portland, **$21,657.** CD 7/18.

Pennsylvania — COAL MINING DEVELOPMENT—Cambria Fuel Co., 116 Market St., J. L. Evans, Westmont, Johnstown, genl. supt., developing 4,800 acre coal mining property, 3 track tipple, installing preparation and sizing machinery, loading and conveying equip., Stonycreek and Somerset Twps., Somerset Co., own forces. Over **$100,000.**

UNCLASSIFIED (Contracts Awarded, Cont'd.)

Pa., Altoona — TROLLEY TRACK REMOVAL—F. M. Hunter, councilman, in charge, removing abandoned trolley tracks, repaving afterwards, own forces. **$40,000-$60,000.** B. H. Schwab, city engr.

★**Tenn., Nashville** — CAR TRACK REMOVAL—T. L. Cummius, mayor, removing street car tracks, repairing streets. **WPA, $710,000.** F. Beasely, Nashville, engr.

★**†Tenn., Tullahoma**—AIRFIELD—War Dpt., 20 St. and Constitution Ave., N.W., Wash., D. C., taxiways, aprons, roads for 128 Observation Squadron airfield, Camp Forest, to T. M. Strider Co., Cotton States Bldg., Nashville, and Weymouth Constr. Co., 611 N. Bway., Milwaukee, Wis., $1,201,198. CD 5/8—ENR 5/15.

Tex., Cuero—FLYING FIELD IMPROVEMENTS—Brayton Flying Service, Inc., c/o Brayton Flying Field, addnl. expansion and imprvs. flying field, school, shops, hangar, force account. **$90,000.**

†Tex., Houston — HANGAR — U. S. Eng., Santa Fe Bldg., Galveston, hangar lean-to and hangar expansion, to Claude Everett, Inc., 522 Barziza St. **$67,400.**

†Tex., Kingsville—MONITORING STATION—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., monitoring station, 6 mi. south of here. **WPA. $41,000.**

†Tex., Mission—ELECTRIC SYSTEM—U. S. Eng., Santa Fe Ry. Bldg., Galveston, electric sys. in military area of Air Corps Training School, and facilities, to Eugene Ashe Electric Co., Bankers Mortgage Bldg., Houston. Approx. **$250,000.**

Tex., Waco—PAVILION—Rein.-con. pavilion, facilities, Lake Waco, **WPA. $73,221.**

★**†Washington**—STEEL TOWERS—Bonneville Power Administration, P. O. Box 3537, Portland, Ore., furnishing steel towers, etc. for Grand Coulee-Midway, Midway North Bonneville and North Bonneville-Vancouver transmission lines, to American Bridge Co., Frick Bldg., Pittsburgh, Pa., **$1,400,378.**

Wash., Seattle—TRANSFORMERS—Installing transformers, switch gear, equip., South Station, force account. **$78,570.** E. R. Hoffman, City Light Bldg., engr.

★**†Exuma**—NAVAL BASE—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave., N. W., Wash., D. C., Naval Base on uninhabited island of Exuma, south of Bahamas, to Frederick Snare Corp, 114 Liberty St., New York City, N. Y.

Alta., Pearce — HANGAR, etc. — Dpt. National Defense for Air, Ottawa, Ont., 1 hangar, 20 buildings, Elementary Flying Training School, to Shoquist Constr. Ltd., 411 Duchess St., Saskatoon, Sask. About **$250,000.**

★**Man., Neepawa**—AIRPORT, etc.—Dpt. National Defense for Air, Ottawa, Ont., one single one double hangars, etc., airport, to Bird Constr. Co. Ltd., 708 Confederation Life Bldg., Winnipeg, **$500,000.** CD 5/12—ENR 5/15.

Ont., Centralia—HANGARS, etc.—Dpt. National Defense for Air, Ottawa, hangars, various bldgs., F. T. School, to Russell Constr. Co., Ltd., Harbour Comm. Bldg., Toronto. About **$250,000.**

★**Sask., Caron**—HANGARS, etc.—Dpt. National Defense for Air, Ottawa, Ont., hangare, various bldgs., Elementary F. T. School, to Smith Bros. & Wilson, Ltd., 104 Dominion Bank Bldg., Moose Jaw. About **$500,000.**

LATIN AMERICA

Mexico—C. Juarez Government, Palacio Municipal Ciudad Juarez, Chihuahua, plans large modern public market, financed by loan from State Government, work starts in 60 days, $110,000***S. M. de La Laguna, Torreson, Coahuila, Mexico, plans malta fever nospital to be built with cooperation of Federal Public Health Dpt., work starts within 90 days, $110,000***Carlos F. Berisitain, c/o Scrita de Hacienda, Mexico, plans chlorate of potasium factory, production within 180 days, $220,000.

PUBLIC BUILDINGS

PROPOSED WORK

†Ala., Tuskegee—Defense Housing Div. Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 30 defense housing units.

†Ariz., Bisbee—Buena School Dist. 68 of Cochise Co., school addn., Docket Ariz. 2-101. $16,782. **FWA.**

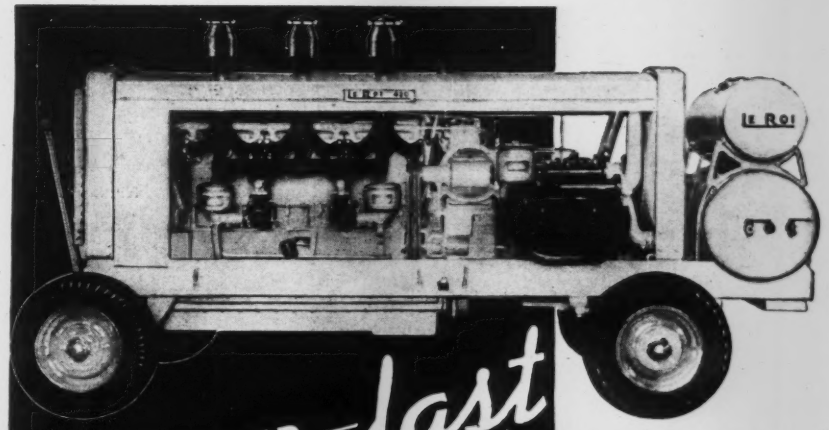
★**Ark., Clarksville**—North West Regional Housing Auth., c/o W. L. Hunt, low cost housing in 15 northwest Arkansas counties. $500,000.

Ark., Little Rock—State, M. B. McLeod, state comptroller, nurses homes, for University of Arkansas Medical School. $300,000.

★**Ark., Lonoke** — East-Central Arkansas Housing Auth., c/o J. M. Malone, Lonoke, low cost housing, 14 central Arkansas counties. $500,000.

†Calif., Bradley—Bradley Union School Dist. of Monterey Co. 1 room school addn., Docket Calif. 4-102. $14,500. **DPW.**

†Calif., Brisbane — Brisbane Elementary School Dist. of San Mateo Co., school addn., Docket Calif. 4-103. $45,438. **FWA.**



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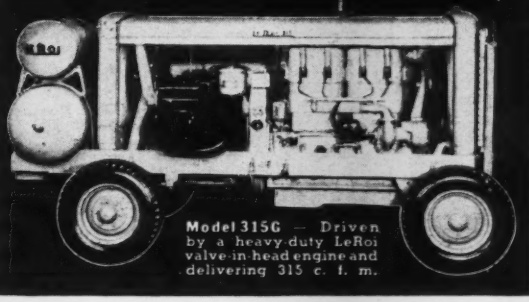

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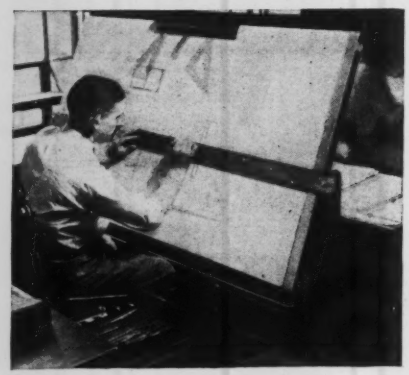

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

★†**Calif., Burbank**—Burbank Unified School Dist. of Los Angeles Co., schools, school addns., Docket Calif. 4-116, $631,400. **FWA.** CD 7/25—ENR 7/31.

†**Calif., Campo**—Defense Housing Div., Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 30 demountable units on reservation.

†**Calif., Hawthorne**—Hawthorne Elementary School Dist. of Los Angeles Co., schools, Docket Calif. 4-118. $207,527. **FWA.** CD 7/16—ENR 7/24.

†**Calif., Lemoore**—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., addnl. temporary construction, 9 cadet barracks, 2 cadet day rooms, 2 cadet supply rooms, cadet mess, operations building, school, utilities. $243,500.

†**Calif., Long Beach-San Pedro**—Defense Housing Div., Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 485 defense housing units in Long Beach-San Pedro Harbor area.

†**Calif., Los Angeles**—Old River Elementary School Dist. of Los Angeles Co., school addns., equip., Docket Calif. 4-104. $46,883. **FWA.**

★**Calif., Los Angeles**—Los Angeles Housing Auth., 1031 S. Bway., plans completed by Planning Associates, P. Williams, etc., Architects Bldg., and bids latter part September, 185 unit Hacienda Village housing, 103-107 Sts., Success Ave. and Compton Blvd. $733,000.

†**Calif., Lynwood** — Lynwood Elementary School Dist. of Los Angeles Co., schools, Docket Calif. 4-118. $207,527. **FWA.**

†**Calif., March Field**—U. S. Eng., 751 South Figueroa St., Los Angeles, indefinitely postponed bids to have been opened Aug. 28, service club, infirmary, Q.M. warehouse, oil storage bldg. CD 8/21.

†**Calif., Monterey**—Monterey City School Dist. of Monterey Co. new school and 3 schools addns. Docket Calif., 4-106, $284,045. **DPW.**

★†**Calif., San Diego**—San Diego Unified School Dist. of San Diego Co., 24 school bldg. units and 235 classrooms, Docket Calif. 4-110. $3,046,100. **FWA.**

Colo., Denver—Denver Housing Auth., plans by R. H. Ervin, Security Bldg., and J. K. Monroe, 2150 Curtis St., 75 unit housing, 25 and Arapahoe Sts. $348,000.

★**Conn., New Haven**—State Bd. Educ., State House, Hartford, plans by Polak & Sullivan, 1399 Chapel St., and R. W. Foote, archts., 157 Church St., brick, steel, concrete school. $700,000. CD 1/2—ENR 9/9.

†**Del., Lewes**—War Dpt., 20 St. and Constitution Ave. N. W., Wash., D. C., housing, utilities, small infirmary, heated ambulance garage for 25 officers and 550 enlisted men, Post Artillery Cape Henlopen.

Del., Newark—Newark Special School Dist. approved $150,000 bond issue, school. CD 2/18—ENR 2/20.

†**Fla., Starke**—Bd. Pub. Instructions, Bradford Co., school addns., alterations, Docket Fla. 8-101. $111,801. **FWA.**

Fla., Tallahassee—State, plans by Hadley & Anderson, archts. and engrs., St. Petersburg, and bids soon, new wing addn. State Capitol. $300,000. CD 5/21—ENR 5/29.

†**Ill., Joliet**—Silver Cross Hospital, hospital addn., Docket Ill. 11-117. $80,000. **FWA.**

†**Ill., Rantoul**—School Dist. 137, Champaign Co., 2 story school addn., Docket Ill. 1-102. $123,793. **DPW.**

Kan., Arkansas City—G. Wylie, mayor, $175,000 bond election Sept. 16, hospital. CD 3/10—ENR 3/13.

†**Me., Bath**—City, 8 room high school addn., Docket Me. 17-102. $134,000. **DPW.**

†**Me., Bath**—City, school, Docket Me. 17-101. $161,000. **DPW.**

†**Me., Kittery**—Town, 16 room elementary school, Docket Me. 17-105. $347,960. **DPW.**

★†**Md., Annapolis**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., hospital alterations and addns. $1,750,000. Appropriation granted. CD 6/13—ENR 6/26.

★†**Mass., Boston**—Meisel Gear Co., 944 Dorchester Ave., plant for manufacture airplane parts, for Navy Dpt. $803,000 for land and buildings, $879,504 for machinery and equip. Defense Plant Corp. will finance.

†**Mass., Bourne**—United Service Organizations, Inc., recreational center, Docket Mass. 19-115. $82,000. **DPW.**

†**Mich., Battle Creek**—Bd. Educ. plans by L. J. Sarvis, 201 Bailey Bldg., 2 story, bsmnt., brick, steel, stone, concrete Urbandale elementary and Junior High School, Docket 20-103. $198,250. **FWA.** CD 8/25—ENR 8/28.

★†**Mich., Ferndale**—N. A. Woodworth Co., Ferndale, plant for manufacture engine parts for War Dpt. $83,000 for buildings, $509,045 for machinery and equip. Defense Plant Corp. will finance.

†**Mich., Lakeview (Battle Creek)**—Lakeview Consolidated School Dist. of Battle Creek Twp., Calhoun Co., school addn., Docket Mich. 20,119. $185,560. **FWA.** CD 8/6—ENR 8/14.

†**Mich., Redford Twp.** — Redford Union School Dist. 1, Wayne Co., school, Docket Mich. 20-108. $240,200. **FWA.**

Minn., Mankato—Bd. Educ., L. M. Veigel, clk., plans by Pass & Rockey, Mankato, high school. $150,000. CD 7/28—ENR 7/31.

†**Miss., Hattiesburg**—City, 2 story, [illegible] mnt. recreational bldg. Docket Miss. 22-102. $200,000. **DPW.**

Mo., Ferguson (St. Louis P. O.)—[illegible]oline School Dist., C. P. Wiegand, secy., Cl[illegible]mbers Rd., St. Louis County, brick, concrete [illegible]stone school, Moline Dist. $150,000. Will [illegible]y for PWA funds.

†**Mo., St. Charles**—Farm Security [illegible]min., c/o Dist. Engineer, Court House, bids [illegible]n 60 housing units, incl. utilities, north [illegible] Village of Dardenne. CD 8/21—ENR 8/28.

Neb., Norfolk—State Bd. Control, [illegible] F. Peterson, secy., Lincoln, plans by J. [illegible] Stitt & E. B. Watson, Norfolk, ward building, State Hospital. $240,000. CD 12/10—ENR [illegible]12.

★†**N. H., Portsmouth**—City, 50 room [illegible]rmanent senior high school, Docket N. H. 27-102. $935,000. CD 7/23—ENR 7/31.

★†**N. J., Belleville** — Isolantite, In[illegible]343 Cortlandt Ave., bids soon 3 story, [illegible]x290 ft., rein.-con. plant for manufacture radio equip. for War Dpt. $275,000 for land and buildings, $697,774 for machinery and equip. Defense Plant Corp. will finance. Parkinson Co., 222 S. 12 St., Newark, engrs. and archts. CD 8/26—ENR 8/28.

★†**N. J., Dover**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., storage buildings, Lake Denmark Naval Arsenal. $645,000.

†**N. J., Raritan** and **Woodbridge**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., bids soon 1 story, 60x800 ft., brick, steel shipping and packing building, also two 10x800 ft. loading platforms, Raritan Arsenal.

†**N. J., Winfield**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 21 room school for defense housing project. $250,000.

†**N. Y., Black River**—United Service Organizations, Inc., recreational center, Docket N. Y. 30-106, $73,400. **DPW.**

N. Y., Cheektowaga—Pine Hill Union Free School Dist. 1, plans by Bley & Lyman, 505 Delaware Ave., Buffalo, school. $200,000.

★†**N. Y., Lackawanna** — Bd. Educ., Senior High School, Docket N. Y. 30-105. $1,112,497. **FWA.**

N. Y., Manhasset—Plans by Tooker & Marsh, 101 Park Ave., New York, grade and high school addns. $357,000.

N. Y., Niagara Falls—W. D. Robbins, city mgr., City Hall, plans by Association of Licensed Architects of Niagara Falls, 2637 Main St., hospital $400,000. CD 7/18—ENR 7/24.

N. C., Charlotte—Bd. Comrs., Mecklenburg Co., plans by W. Hook, Commercial Bank Bldg., Charlotte, 20 room school, Charlotte-Gastonia Hy. $150,000.

†**N. C., Fayetteville**—Cumberland Co., health center building, Docket N. C. 31-108, $85,000. **DPW.**

†**N. C., Fayetteville**—Cumberland Co. Bd. Educ., school, etc., Docket N.C. 31-107, $103,000; school, Docket N.C. 31-124, $24,700. **FWA.**

N. C., Graham—Bd. Comrs. Alamance Co., D. C. Bryan, Burlington, chn., voted $200,000 bonds, hospital. CD 7/24—ENR 7/31.

N. C., Wilmington—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 2 buildings to serve as recreation center for white, one for negro soldiers on leave from Camp Davis. $150,000.

O., Columbus—Dpt. Agriculture, J. T. Brown, dir., State Office Bldg., plans by R. B. Schildknecht, state archt., State Office Bldg., junior fair dormitory and exhibit bldg., Ohio State Fairgrounds. $380,000.

O., Columbus — Dpt. Welfare, State Office Bldg., C. Sherwood, dir., plans by Harsch, Sims & Ramsey, 145 N. High St., hospital. $275,000.

★†**O., Cleveland**—Republic Steel Co., C. A. Thayer, ch. engr., Republic Bldg., blast furnace plant. $14,000,000. Defense Plant Corp. will finance. CD 8/27—ENR 9/4.

†**O., Elyria**—Romec Pump Co., P. Ryan, pres., 333 E. Bridge St., plans completed by Silsbee & Smith, Turner Blk., 1 story, 175x365 ft., brick, steel factory and office bldg. Defense Plant Corp. will finance. CD 9/2—ENR 9/4.

O., Mt. Vernon—Dpt. Welfare, State Office Bldg., Columbus, plans by Walker, Norwick & Templin, Amer. Bldg., Dayton, insane-tuberculosis bldg., State Tuberculosis Sanitarium. $375,000. CD 3/17—ENR 3/20.

O., Port Clinton—Allen Twp. Bd. Educ., Curtice, $150,000 bond election, Nov. 4, centralized school.

O., Port Clinton—Bd. Comrs. Ottawa Co., $160,000 bond election Nov. 4, court house annex. C. H. Shively, 400½ Croghan St., Fremont, archt. D. J. Missen, Port Clinton, co. engr.

†**O., Ravenna**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., and Comrs. Portage Co. Ravenna bids soon hospital addn. and nurses home, Docket 33-101. CD 8/25—ENR 8/28.

O., Wooster—Dpt. Agriculture, J. T. Brown, dir., State Office Bldg., Columbus, plans by R. B. Schildknecht, state archt., State Office Bldg., Columbus, power house at Ohio State Agriculture Experiment Station. $150,000.

†**Ore., Pendleton**—School Dist. 16, Umatilla Co., school, school addn., Docket Ore. 35-105. $155,586. **FWA.**

PUBLIC BLDGS. (Proposed Work, Cont'd.)

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., R. G. Woodside, controller, County Office Bldg., rejected bids Aug. 19, jail buildings. CD 8/6—ENR 8/14.

★**R. I., Woonsocket** — Woonsocket Housing Auth., W. M. Gauvreau, chn., 455 Carrington Ave., bids soon, 300 two story dwelling units. $1,100,000. Walter Fontaine, Inc., 285 Main St., archt. Char A. Maguire & Assoc., 613 Turks Head Bldg., Providence, engrs. CD 6/16—ENR 6/19.

†**Tenn., Camp Forest**—U. S. Eng., U. S. Courthouse, Nashville, boiler house and heating sys. for Type DH-1 hangar, 128th Observation Squadron Airfield.

Tenn., Knoxville—W. W. Mynatt, city mgr., brick, rein.-con. detention home. $150,000.

†**Tenn., Nashville**—Nashville Housing Auth. rejected bids June 20, 300 residences, for USHA. CD 6/30, under LB.

★**Tex., Beaumont**—Bd. Educ., plans by Stone & Pitts, Goodhue Bldg., school. $859,500. Applied for DPW funds.

Tex., Brackettville—Bd. Educ., W. W. Price, plans by C. H. Page & Son, Box 936, Austin, school. $150,000. Applied for Federal funds.

†**Tex., Corpus Christi**—Flour Bluff Common School Dist. 32 Nueces Co., plans by R. L. Vogler, Nixon Bldg., high school, Docket Tex. 41-126, $150,000. **DPW.**

†**Tex., Freeport**—Public Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 200 defense housing units.

★**Tex., Houston**—Bond election Sept. 27, tuberculosis hospital. $650,000. J. G. Turney, city engr.

★**Tex., Houston**—Bd. Educ., c/o secretary, plans by A. C. Finn, 1005 Bankers Mortgage Bldg., constructing, equipping 39 temporary schools, 8 combination recreation and cafeteria halls, utility exten., etc. $596,500. Application filed for FWA funds.

†**Tex., Orange**—Orange Independent School Dist. of Orange Co., Junior-Senior High School, also repairing, remodeling 4 schools. Tex. 41-135, $499,491. **DWP.**

Tex., San Benito—San Benito Housing Auth., c/o E. W. Franke, chn., 102 N. Sam Houston St., surveys 100 unit housing. $400,000. Plans application to USHA. CD 8/18—ENR 8/21.

†**Tex., Texas City**—City fire station, Docket Tex. 41-109, $24,882. **DPW.**

†**Va., Newport News**—City of Newport News plans by Cooke & Van Leeuwen, Arcade Bldg., Leigh Memorial Hospital addn. $348,300. **FWA.** (**Correction**—location of project.) CD 8/28—ENR 9/4.

†**Va., Newport News-Yorktown**—Local Housing Auth., through United States Housing Auth., F St. between 18 and 19 Sts. N.W., Wash., D. C., 362 defense housing units in above locality.

†**Va., Norfolk**—City hospital addn., Docket Va. 44-103, $333,364. **DPW.**

†**Wash., Keyport**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 300 defense housing units.

†**Wash., Poulsbo**—Poulsbo School Dist. 13, Kitsap Co., school impvrs., Docket Wash. 45-1-5, $78,400. **DPW.**

†**Wash., Silverdale**—School Dist. 24, Kitsap Co., 9 room grade school, Docket Wash. 45-108. $125,000. **DPW**

Wash., Tacoma—Pierce Co., Courthouse, G. R. Melton, chn. Co. Comn., plans by Mock & Morrison, Perkins Bldg., county hospital addn. Seeking PWA funds. CD 8/5—ENR 8/7.

†**Wis., Sturgeon Bay**—Leatham Smith Coal & Shipbuilding Co., Sturgeon Bay, plant for manufacture cargo boats for Maritime Comn. $108,000 for land and buildings, $42,000 for machinery and equip.

†**Canal Zone**—Office Con. Q.M., P. C. Dept., Quarry Heights, Canal Zone, superstructure, incl. plumbing, armament and instrument inspection and adjustment bldg., Howard and Albrook Fields, Spec. 4096-E, to Southern Co., Inc., P. O. Box 1127, Panama, Republic of Panama. **$166,536.** Awarded 8/12. CD 7/8—ENR 7/10.

★**Ontario**—Wartime housing Ltd., 55 York St., Toronto, housing facilities, women workers. $500,000.

★**Ont., Ottawa**—Secy. Dpt. P. Wks., bids soon, office bldg. for Dpt. National Defense for Sea. $600,000-$700,000. C. D. Sutherland, c/o owner, engr.

BIDS ASKED

Bids Asked About October 15

†**Colo., Fort Lupton**—Farm Security Admin., 1025 14 St., Denver, Colo., farm labor camp, sewers, water lines, gas distr. sys., grading, roads, streets, permanent buildings, family homes, shelters, etc. $300,000. CD 7/16—ENR 7/24.

Bids Asked September 16

†**N. C., Camp Davis**—Con. Q.M., 2 cantonment type buildings, oil house, grease and wash racks; adv. ENR 9/11.

Tenn., Jackson—Jackson Housing Auth., R. M. Wisdom, chn., 203 Commercial Bldg., 100 unit, Allenton Heights, (white) housing Tenn. 7-1, Allen Ave.; and 96 unit, Merry-Lane Courts (negro) housing, Tenn 7-2, Market St. CD 6/30—ENR 7/3.

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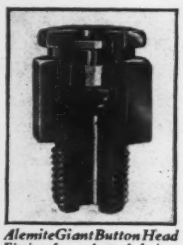

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

Bids Asked September 17

†**La., Abbeville** — Farm Security Admin., Donaghey Bldg., Little Rock, Ark., necessary bldgs. for farmsteads.

†**La., Oak Grove**—Farm Security Admin., Donaghey Bldg., Little Rock, Ark., 12 dwellings, 11 barns, 11 poultry houses, 11 smoke houses and 12 wells.

†**Miss., Hernando**—Farm Security Admin., Donaghey Bldg., Little Rock, Ark., farmstead bldgs.

N. Y., Brooklyn — Superintendent School Bldgs., Design & Constr. 49 Flatbush Ave. exten., P.S. 35 addn. Lewis Ave., McDonough and Decatur Sts. CD 8/15—ENR 8/21.

Bids Asked September 18

N. Y., West New Brighton (sta. Staten Island)—Dpt. P. Wks., Municipal Bldg., New York, court house alterations, Bement and Castleton Aves.

Bids Asked September 19

†**Ore., Portland**—U. S. Eng., Pittock Blk., commissary bldg., Portland-Columbia airport, Inv. 698-42-142.

Bids Asked September 22

†**Md., Aberdeen**—U. S. Eng., 332 Post Office Bldg., Baltimore, roof and walls on existing 200 ft. square rein.-con. structure, Edgewood Arsenal; adv. ENR 9/11.

Wis., Whitefish Bay (Milwaukee P. O.)—Bd. Educ., high school gymnasium addn. $300,000. H. W. Tullgren, 1234 N. Prospect Ave., Milwaukee, archt.

Bids Asked September 23

†**N. Y., Iona Island**—Pub. Wks. Officer, 3rd Naval Dist., 90 Church St., New York, inert storehouse and fuse magazine, Naval Ammunition Depot, Spec. 10532.

Bids Asked September 26

Ore., Milwaukie—Milwaukie Housing Auth., 400 Masonic Bldg., Oregon City, 100 unit housing, Ore-1-3. $250,000. USHA. R. L. Morin, Pub. Serv. Bldg., Portland, archt. CD 1/2—ENR 1/9.

Bids Asked About September 27

★†**Wash., Seattle** — Seattle Housing Auth., Central Bldg., 700 units Gatewood Heights defense housing. $2,100,000. J. L. Holmes and V. N. Jones, New World Life Bldg., archts. D. C. Griffin, Lloyd Bldg., engr. CD 8/4—ENR 8/7.

Bids Asked September 30

Ia., Durant—L. Schneckloth, town clk., municipal electric light and power plant, distr. sys. $115,000. Stanley Eng. Co., Muscatine, Ia., engr. CD 7/15—ENR 7/17.

Bids Asked October 1

†**Md., Annapolis**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., instruction and storage building and rifle range. Spec. 10486. CD 7/22—ENR 7/24.

Bids Asked October 6

★**Ill., Rockford**—Winnebago Co. Housing Auth., Rockford, 200 unit housing. $800,000. Extended date. R. A. Orput, Rockford, archt. CD 7/2—ENR 7/10.

Bids Asked After October 15

Ia., Murray—Power plant and distr. sys. $80,000. A. S. Harrington, Baum Bldg., Omaha, Neb., engr. CD 8/20—ENR 8/28.

Bids Asked About December 1

†**La., Pearl River**—U. S. Eng., Federal Bldg., Mobile, Ala., constructing Bogue Chitto and Pools Bluff Sills, incl. all masonry, earthwork, metal work, steel sheet piling, etc. Bids about Aug. 25 cancelled. CD 8/15.

Bids Asked

★†**Calif., Richmond**—Richmond Housing Auth., W. J. Richards, Jr., chn., 271 10 St., 450 defense housing units, Cal. 4171-X. $1,750,000. CD 7/28—ENR 7/31.

N. J., Union—2 story, bsmnt. brick, steel, municipal bldg., Firberger Park. $250,000.

N. Y., Champlain—Bd. Educ., Central School Dist., school. $150,000. A. W. Inman, 27 Clinton St., Plattsburg, archt. CD 4/15—ENR 4/17.

★†**N. J., Dover**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 300 defense housing units, 5 Salem St. $1,050,000.

LOW BIDDERS

Calif., Fresno—Fresno Housing Auth., low rent housing, Proj. Cal. 6-3, from Midstate & Harris Constr. Co., Pacific Southwest Bldg., Fresno. **$240,559.** CD 8/6—ENR 8/14.

†**Kan., Fort Riley**—Pub. Bldgs. Administration, 9 and D Sts. S. W., Wash., D. C., Aug. 28, 40 defense housing units, from Ernst Rokahr & Sons, 1815 Y St., Lincoln, Neb. $163,798. Bids 8/28. CD 6/3—ENR 6/12.

†**La., New Orleans**—Civil Aeronautics Admin., Commerce Bldg., Wash., D. C., Aug. 28, radio communication facility transmitter and receiver bldgs., from Perrilliat Rickey Constr. Co. Inc., 1530 S. Rendon St., **$66,657.** CD 8/11—ENR 8/14.

★†**Md., Baltimore**—Public Bldgs. Administration, 9 and D Sts. S.W., Wash., D. C., Sept. 2, 697 housing units for aircraft workers, Project 18091, from Cauldwell-Wingate Co., 101 Park Ave., New York, N. Y., **$3,383,000.**

★†**Miss., Biloxi**—Biloxi Housing Auth., Bldg., 20, 175 defense housing units for army personnel and civilian employees, Air Corps Technical School, Miss. 22031-X, for USHA, from Forcum-James Co., 628 Dermon Bldg., Memphis, Tenn. **$681,400.** Est. $500,000. CD 8/11—ENR 8/14.

†**Miss., Meridian**—Pub. Bldgs. Admin., 7 and 9 Sts. S.W., Wash., D. C., Aug. 29, 100 defense housing units near Key Field, from Perry Constr. Co., Philadelphia, Miss. Bids **(1) $419,340, (2) $439,340.** CD 8/22.

†**Mo., Kansas City**—Con. Q.M., Sept. 1 story, 73x94 ft. concrete utility bldg., additional story to existing bldg. and canopies over loading docks at quartermaster depot, Independence and Hardesty Sts., from Universal Constr. Co., Scarritt Bldg., **$144,868.**

N. H., Concord—State, Comptrollers Office, State House, Sept. 3, Brown Building, 3 story, 56x148 ft., brick, stone, from Davidson Constr. Co., 1306 Elm St., Manchester, **$154,134.** CD 8/13—ENR 8/21.

★†**O., Euclid**—United States Housing Auth., F St., between 18 and 19 Sts. N.W., Wash., D. C., Aug. 25, defense housing, from Schirmer-Peterson Co., 6830 Beaver Ave., Cleveland. **$2,000,000** (90 days). CD 8/14.

★†**O., Massillon**—Public Bldgs. Administration, 9 and D Sts. S.W., Wash., D. C., Sept. 2, 300 defense housing units for industrial workers in Massillon-Canton area, from Henry Dattner, 1515 Barlum Tower, Detroit, Mich. **$1,220,000.** CD 7/22—ENR 7/24.

S. C., Aiken—Housing Auth., C. E. Simons, Jr., exec.-dir., Sept. 3, Stoney Homes, housing, SC 7-2, from Claussen-Lawrence Constr. Co., Augusta, Ga. **$151,450.** CD 8/27—ENR 8/21.

†**Tex., Lamesa**—Farm Security Admin., Admin. Bldg., Fair Park, Dallas, Aug. 29, farm labor camp, from Fox Rig & Lumber Co., Ardmore, Okla., **$206,000.** CD 8/18—ENR 8/21.

★†**Tex., Wichita Falls** — Public Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., Sept. 2, 175 housing units, No. 41121, from Thomas Bate & Sons, 1107 Girard Ave., Houston. Bids **(1) $649,683, (2) $669,683.** CD 7/10—ENR 7/17.

CONTRACTS AWARDED

★†**Ala., Huntsville**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., chemical shell assembly plant, Redstone Ordnance plant, to C. G. Kershaw Contg. Co., 2212-20 Ave. S., Birmingham, Engineers Ltd., 225 Bush St., San Francisco, Calif., and Walter Butler Co., 1030 Minn. Bldg., St. Paul, Minn., **$4,606,000.** Whitman, Requardt & Smith, W. Biddle and Charles Sts., Baltimore, Md., engrs. and archts.

★†**Ala., Mobile**—U. S. Eng., Federal Bldg., engine test building, etc., Brookley Field, to Foster & Creighton Co., Amer. Natl. Bank Bldg., Nashville, Tenn., **$866,285.** Bids 6/27. CD 7/1—ENR 7/10.

†**Ala., Sylacauga**—Coosa Valley Housing Auth., F St. between 18 and 19 Sts. N.W., Wash., D. C., 150 defense housing units for civilian workers in ordnance plant, Project 1072-X, for USHA, to Daniel Constr. Co., 824 & Ave. S, Birmingham, **$487,457.** Bids 8/19. R. Sizemore, 115 S. Union St., Montgomery, archt. CD 8/13.

†**Ala., Talladega**—Coosa Valley Housing Auth., Sylacauga, 150 housing units for civilian workers in ordnance plant, Project 1072-X, for USHA, to Daniel Constr. Co., 824 7 Ave. S., Birmingham, **$485,600.** R. Sizemore, 115 S. Union St., Montgomery, archt. Bids 8/19. CD 8/13.

†**Ark., Camp Jos. T. Robinson**—Con. Q.M., pontoon storage shed, theatre, to William Peterson, Commercial Theatre Bldg., Little Rock. **$63,350.** Bids 8/12.

★†**Calif., McClellan Field**—U. S. Eng., 208 Post Office Bldg., Sacramento, engine test bldg., to Ford J. Twaits Co., 816 W. 5 St., Los Angeles, **$829,244.** CD 7/7—ENR 7/10, under LB.

★†**Calif., Santa Maria**—Con. Q.M., 74 New Montgomery St., San Francisco, armored division cantonment, Santa Maria-Lompoc, to MacDonald & Kahn., Inc., Financial Center Bldg., San Francisco, and J. F. Shea Co., Inc., 617 S. Olive St., Los Angeles, **$17,382,682.** CD 8/29—ENR 9/4.

★†**Conn., Bridgeport**—Federal Works Agency 7 and D Sts. S.W., Wash., D. C., 400 dwelling units for defense housing, Success Park, Conn. 60520X, to James T. Brady & Co., Inc., 606 West 47 St., New York, N. Y. **$1,527,000.** Est. $1,200,000. CD 8/13—ENR 8/21.

†**Conn., New London**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 100 defense housing units, Submarine Base, to Wadhams May & Carey Co., 15 Lewis St., Hartford. Est. **$360,000.** CD 5/26—ENR 5/29.

★†**D. C., Wash.**—United States Housing Auth., F St. between 18 and 19 Sts. N.W., Wash., D. C., 250 defense housing units, Navy Yard, Project 49016 X, to Dyker Building Co., 122 East 42 St., New York, N. Y. **$949,500.**

★†**Ill., Carbondale**—Sherwin-Williams Co., A. W. Stendel, pres., 101 W. Prospect Ave.,

PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

Cleveland, O., shell and bomb loading plant, known as Illinois Ordnance Plant, shore Crab Orchard Lake, 8 mi. east of here, for War Dpt., to S. A. Healy, 22 N. La Salle St., Chicago, and M. J. Boyle & Co., 1744 N. Mozrt St., Chicago. Est. **$27,000,000.** Charles W. Cole & Sons, South Bend, Ind., engrs. **(Correction**—contractor.) CD 8/22—ENR 8/28.

†**Ill., Chanute Field**—Con. Q.M., storehouses, to Thorp-Rogoff Co., 306 S. Wabash Ave., Chicago, Ill., **$140,996.** Bids 8/8. CD 7/21—ENR 7/24.

★**Ill., East St. Louis**—St. Clair County Housing Auth., E. P. Griffin, chn., and L. E. Davenport, dir., Spivey Bldg., general contract landscaping 264 unit Samuel Gompers Homes Housing, Ill. 1-1 and 143 unit John Robinson Homes, Ill. 1-2, to W. E. O'Neil Constr. Co., 2751 Clybourn Ave., Chicago, **$1,193,000*****plumbing, to E. Maag Plumbing & Heating Co., 333 N. 5 St., East St. Louis, **$303,869*****heating, to Belleville Sheet Metal Wks., Belleville, **$86,137*****electrical work, to Bradford Armature Wks., 1015 Missouri Ave., **$60,368.** USHA. Grand total $1,643,374. Bids 8/5, awarded 9/5. CD 8/8—ENR 8/14.

Ia., Waverly—Imprv. power plant, incl. Diesel engine, to Worthington Pump & Mchy. Co., 400 W. Madison St., Chicago, Ill., **$60,193.** CD 7/25—ENR 7/31.

Ky., Lexington—Dpt. Hys., highway materials research laboratory, University of Kentucky, to Skinner Bros., Lexington. **$41,277.** Bids 8/20, awarded 8/26.

★†**La., New Orleans**—New Orleans Housing Auth., 226 Carondelet St., 325 defense housing units for USHA, Florida Ave., Moss St. and Bayou St. John, La. 1604X, to R. P. Farnsworth & Co., Inc., 1515 S. Salcedo St. **$1,134,493.** Bids 8/29, awarded 9/2. Rosenthal, Kessels & Jones, 226 Carondelet St., archts. CD 9/3.

★†**Mass., Chicopee**—Chicopee Housing Auth., O. A. Savaria, chn., 64 Center St., 300 defense housing units, Mass. 19022X, for USHA, to John Bowen Co., 129 Newbury St., Boston. **$1,118,750.** Bids 8/20—ENR 9/5. CD 8/22—ENR 8/24.

★†**Mo., Louisiana** — Hercules Powder Co., Delaware Trust Bldg., Wilmington, Del., Anhydrous Ammonia plant for War Dpt., to Bechtel-McCone-Parsons Corps., 601 W. 5 St., Los Angeles, Calif., **$16,750,000** cost-plus-fixed-fee-basis. CD 6/20—ENR 6/26.

★†**Nevada**—Basic Magnesium, Inc., Hanna Bldg., Cleveland, O., magnesium plant, 2 mi. southwest Midway between Las Vegas and Boulder City, for War Dpt., to McNeil Constr. Co., 860 Avalon Blvd., Los Angeles, buildings and utilities **$21,000,000,** equip. **$42,000,000.** Total cost $63,000,000. CD 8/19—ENR 8/21.

†**N. J., Clifton**—Air Cruisers, Inc., 330 Highland Ave., 2 story, bsmnt., 100x340 ft., brick, steel plant, Bloomfield Ave., for War Dpt., to Edmund R. Stearns Co., 84 Glen Ridge Ave., Montclair, **$253,942** incl. equip. CD 8/15—ENR 8/21.

★†**N. J., Dover**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 14 brick, steel concrete arsenal buildings, Picatinny Arsenal, to Frank Briscoe Co., Inc., 287 S. 19 St., Newark, **$963,940.** CD 8/19—ENR 8/21.

†**N. J., Fort Monmouth**—Con. Q.M., ordinance bldg., sidewalks, drives, roads, streets, bridges, drainage sys., landscaping, etc., **WPA, $339,691.**

†**N. Y., Hempstead**—U. S. Eng., 17 Battery Pl., New York, hospital bldgs., boiler house, utilities, Mitchel Field, to Iglehart, Caldwell & Scott, Inc., 90 Broad St., New York, **$273,838.**

†**O., Columbus**—Con. Q.M., Fort Hayes, imprv. buildings, facilities, grounds, Fort Hayes, **WPA, $148,024.**

★†**O., Dayton**—Mutual Home Ownership Div. of Federal Works Admin., 9 and D Sts. S.W., Wash., D. C., 500 defense housing units, to Van Buren Twp., southeast of here, to F. H. McGraw, Middletown, **$1,720,000** cost-plus-fixed fee basis. CD 6/3—ENR 6/12.

†**O., Fairfield**—U. S. Eng., Wright Field, Dayton, brick, steel shop for armament fire control and repair, Patterson Field, to Frank Messer & Sons, 2515 Burnet St., Cincinnati, **$95,000.**

★†**O., Lacarne**—Con. Q.M., Erie Proving Ground, 540x1,000 ft. steel, concrete storage warehouse, Erie Ordnance Proving Grounds, to Skilken Bros., 44 E. Broad St., Columbus, **$1,642,621.** Bids 8/25. CD 8/18—ENR 8/21.

★†**O., Newton Falls**—Div. Defense Housing of Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 200 prefabricated dwelling units, to Lockwall Houses, Inc., 225 Bway., New York, N. Y., **$547,700*****100 units to National Refrigerators Co., 100 W. 42 St., New York, N. Y., **$284,475*****50 units, to St. Johns Portable Building Co., 100 W. 42 St., New York, N. Y., and Harry Elgin, 303 S. East Ave., Baltimore, Md., **$152,237.** Grand total $984,412.

†**O., Port Clinton**—Div. Defense Housing, Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 100 housing units, Proving Grounds, to Natl. Homes Corp., Lafayette, Ind., **$280,960.** CD 7/10—ENR 7/17.

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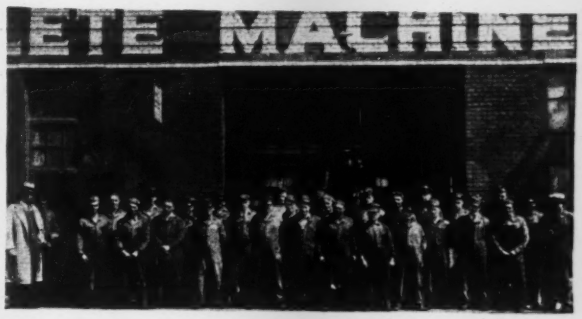

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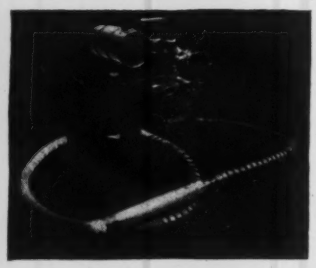

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

†**Pa., Bristol**—Fleetwings, Inc., Bristol, 218x578 ft., 93x162 ft. and 60x60 ft. factory bldgs., to Eastern Constr. Co., 705 Greenwood Ave., Trenton, N. J., **$468,520.** Bids 7/18, awarded 8/28. CD 7/16.

†**Pa., Middletown**—U. S. Eng., 1 and Douglas Sts. N. W., Wash., D. C., paint and dope shop, Middletown Air Depot, to Ritter Bros., 1511 N. Cameron St., Harrisburg. **$244,392.** Awarded 8/28.

★**Pa., Scranton** — Scranton Housing Auth., general contract 240 dwellings, Pa. 3-1, Valley View Terrace, to Tobias Heller & Co., 441 Lexington Ave., New York, N. Y., **$707,000** ***plumbing, to R. T. Frye & Co., 623 10 Ave., New York, N. Y., **$108,437*****heating, to E. A. Compagana, 818 W. Lackawanna Ave., Scranton, **$88,000*****electrical work, to Forrest H. Nourse Co., Harrisburg, **$44,200*****landscaping, to South Side Floral Shop, 1107 Pittston Ave., **$27,500.** USHA. Grand total $975,137. Bids 8/20, awarded 9/6. CD 8/8—ENR 8/14, under LB.

S. D., Vermillion—University of South Dakota, administration bldg. addn. to Gray Constr. Co., Goss Block, Watertown. Total **$200,000.** Bids 7/31. CD 7/10—ENR 7/24.

★†**Tex., Fort Worth**—U. S. Eng., Citizens Bank Bldg., Denison, supplemental contract, aircraft assembly plant addn., to Austin Co., Fort Worth, Tex., and 16112 Euclid Ave., Cleveland, O., **$455,800.** Consolidated Aircraft Corp., 3302 Pacific Hy., San Diego, Calif., will operate.

★**Tex., Galveston**—Galveston Housing Auth., L. W. Henslee, exec. dir., City Hall, 26 two story, low cost housing for negroes, to McGough Bros., 330 Bankers Mortgage Bldg., Houston, **$646,000.** Bids 8/28, awarded 9/2. CD 9/3—ENR 8/7, under LB.

†**Tex., San Angelo Field**—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., accommodations for additional enlisted personnel (Air Corps), to Hill & Combs, Builders Exch, San Antonio, **$331,365.**

†**Va., Portsmouth**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., dispensary, Project 1041, Norfolk Navy Yard, Portsmouth, to Millimet & Assoc., 441 Lexington Ave., New York, N. Y., **$262,000.**

★†**Wash., Renton** — Boeing Aircraft Co., 900x1,100 ft. main assembly bldg., warehouse, office bldg., personnel bldg., boiler house, 2 paint shops, for seaplane plant, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. **$10,000,000.** Defense Plant Corp. will finance. CD 7/8—ENR 7/10.

★†**Wash., Seattle**—Con. Q.M., warehouses, loading platforms, dock, railroads, paving, utilities, Port of Embarkation, to Austin Co., 16112 Euclid Ave., Cleveland, O., **$1,537,936.** Bids 6/28, awarded 8/20. CD 8/7—ENR 8/14.

★†**W. Va., South Charleston**—South Charleston Housing Auth., South Charleston, 400 defense housing units for employees Naval Ordnance Plant, to Engstrom & Wynn, 1117 Chapline St., Wheeling, **$1,364,635.** (**Correction**—contractor). Bids 8/15, awarded 8/21. CD 8/26—ENR 8/28, under CA.

Wis., Rochester—Racine Co., Racine, general contract 1 story, highway garage and warehouse, to Bondgard Constr. Co., 135 Mound Ave.***heating, to Advance Heating Co., Racine***electrical work, to C. M. Surrendonk, Racine***plumbing, to Reineman Hardware Co., Burlington. Est. **$40,000.** Bids 7/31. CD 7/25—ENR 7/31 under Industrial Bldgs.

★**Alta., Edmonton**—Dpt. National Defense for Air, Ottawa, and McKenzie Aircraft, Ltd., Edmonton, plant exten., to H. G. MacDonald, 812 Tegler Bldg. **$600,000.** CD 5/22—ENR 6/5.

★**N. B., Moncton**—Dpt. National Defense for Air, Ottawa, Ont., personnel disposal depot, to Carter-Halls-Aldinger Co., Ltd., 419 Cherry St., Toronto, Ont., about **$2,000,000.**

Ont., Arnprior—Dpt. National Defense for Air, Ottawa, temporary bldgs. for Elementary Training School, to Ontario Constr. Co., Ltd., Ontario St., St. Catharines. About **$175,000.**

★**Ont., Ottawa**—Dpt. Natl. Defense for Air, Ottawa, personnel disposal depot, to Angus W. Robertson, Ltd., 660 St. Catherine St. W., Montreal, Que., about **$1,600,000.**

★**Que., Montreal**—Dpt. National Defense for Air, Ottawa, Ont., personnel disposal depot, to A. Janin & Co., Ltd., 1460 Sherbrooke St. W., about **$1,500,000.**

COMMERCIAL BUILDINGS

PROPOSED WORK

Ark., Little Rock—St. Vincent's Infirmary, 1000 High St., 5 story hospital annex. $299,923.

Calif., Santa Rosa—Chapel of the Chimes, Redwood Hy. and Hearn Ave., plans by L. Nusbaum, 704 Market St., San Francisco, rein.-con. mausoleum. $150,000.

★**Conn., Greenwich**—Moore Holdings, T. H. Raynor, 72 West Putnam Ave., residential development. $500,000 or more.

Ind., Decatur—Central Sugar Corp., Decatur, 50 homes for employees. $175,000.

Mass., Leominster — Leominster Hospital, Hospital Rd., soon lets contract, 2 [illegible] and 38x46 ft. wings, brick, stone, [illegible] addn. $150,000. Kendall Taylor, Columbus Ave., Boston, archts. [illegible] 17 Putnam St., Fitchburg, engr. ENR 7/17.

Mich., Detroit — Yeshivath Beth Yehudah Society, 3535 Elmhurst Ave., plans by Reed stone & Abrams, 3510 Woodward Ave., [illegible] bsmnt., brick, steel school and [illegible] $150,000.

N. Y., Brooklyn—Rondin Realty Corp., 548 Linden Blvd., plans by O. I. Silverstone, 370 Pierrepont St., 6 story, 100x132 ft. apartment, 778 St. Marks Ave. $225,000.

N. Y., New York—Mount Hope Realty Corp., 750 Grand Concourse, plans by J. [illegible] Feiss, 250 W. 57 St., 6 story, 95x109 ft. apartment, Mt. Hope Pl. near Walton Ave. $200,000.

N. Y., New York—Metropolitan Life Insurance Co., 1 Madison Ave., plans by Leonard Schultze & Assoc., 18 E. 48 St., [illegible] story apartment, 1215 5 Ave. $150,000.

★**O., Canton**—Mercy Hospital Assn., 100 bed hospital addn. $506,250. Applied for federal funds.

★**Pa., Erie**—Bd. Trustees, Hamot Hospital, 558 W. 6 St., plans by Meyers & Johnson, archts. and engrs., Commerce Bldg., hospital $1,200,000. CD 9/2—ENR 9/4.

Pa., Oil City—Pennsylvania Telephone Corp., H. N. Engh, genl. mgr., 20 E. 10 St., Erie, bids in September, 1 and 3 story, 50x165 ft., brick, concrete, limestone, granite telephone office, garage and warehouse building, Seneca St. $150,000. Meyers & Johnson, 821 Commerce Bldg., Erie, archts. C. E. Jones, [illegible] owner, ch. engr. CD 3/10—ENR 3/13.

BIDS ASKED

Bids Asked September 15

N. J., Fort Lee—George Washington Village, 118 E. 28 St., New York, 23 two story, bsmnt., brick, steel garden apartments, 119 garages, 4 stores, Linwood Ave., De Young, Moscowitz & Rosenburg, 205 E. 42 St., New York, archts. R. Eberlin, 18 E. 48 St., New York, engr.

Bids Asked

Calif., San Francisco—T. L. Pflueger, archt., 580 Market St., rein.-con. theatre, for San Francisco Theatres, Inc., 745 Clement St. $150,000. CD 8/13—ENR 8/21.

CONTRACTS AWARDED

Calif., Downey—S. W. Hunsaker, 6172 Lewis Ave., Long Beach, brick, stucco dwellings, N. Rancho Los Amigos, near hear. Owner builds. Approx. **$175,000.** C. N. Alrich, 1834 Dawson Ave., Long Beach, archt.

Calif., San Francisco—B. Liebman, 3319 Fillmore St. (1st unit), 15 one story, bsmnt., wood frame homes, Richmond Dist. area, day labor. Total est. over **$150,000.**

Conn., East Hartford (Br. Hartford)—Millbrook Park Co., 50 Main St., 1½ story residences, Millbrook Park. Owner builds. $400,000. L. Kurtz, 15 W. 44 St., New York, N. Y., archt.

Conn., New Britain—New Britain General Hospital, C. F. Bennett, pres. Bd. Dir., 92 Grand St., 3 story, bsmnt., brick, steel, hospital addn., to Carlson & Torell Co., 50 Dwight St., New Britain. Est. over **$150,000.** CD 8/19—ENR 8/21.

Ill., Peoria—Illinois Bell Telephone Co., 212 W. Washington St., Chicago, 2 story, bsmnt., brick, steel, stone, rein.-con. telephone exchange, to V. Jobst & Son, Lehman Bldg., Peoria. Est. **$150,000** with equip. CD 5/9—ENR 5/15.

Ia., Sioux City—Capitol Theatre, 414 Nebraska St., imprv., remodeling theatre, to W. A. Klinger Constr. Co., 201 Warnock Bldg; **$150,000.**

Mass., Worcester—F. W. Woolworth Co., 129 Tremont St., Boston, 3 story, bsmnt., brick steel store, Front and Mechanic Sts., to J. W. Bishop Co., 109 Foster St. Est. **$350,000.** CD 8/25—ENR 8/28.

Mo., St Louis—R. A. Baudendistel, 5617 Devonshire Ave., 11 two story, bsmnt. apartments, 4900 block of Potomac St., 3400 block Lawn Ave. and 5,000 block Oleatha Ave., South St. Louis, own forces and sub-contracts. **$170,000.**

N. J., Oaklyn—Hanley Bros., 6 and Cooper Sts., Camden, addnl. residential development. Owner builds. H. E. Hall, 840 Cooper St., Camden, archt.

N. J., Rahway—Merck & Co., 126 E. Lincoln Ave., 3 story, brick, steel, concrete office bldg. addn., to W. Kidde Constructors, Inc., 140 Cedar St., New York, **$200,000.** Hallinger Co., 105 S. 12 St., Phila., Pa., archt. and engr.

N. Y., Brooklyn—Trump Brighton Corp., 89-17 161 St., Jamaica, 33 one story homes, Bay 20 St. Owner builds. **$185,700.** I. Kalich, 161 Remsem St., archt.

N. Y., New York—American Savings Bank, 125 W. 42 St., bank addn., 125 W. 42 St., to Irons & Reynolds, 420 Lexington Ave. Est. **$200,000.** Morris & O'Connor, 101 Park Ave., archts.

O., Mansfield—Westbrook Country Club, Georgian white brick club addn. replacing frame structure razed by fire, to Zediker Masonry Co., Mansfield, **$150,000.** Awarded 9/4. Althouse & Jones, Mansfield, archt.

COMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

Pa., Chester—J. E. Fieldstein, 2031 Tioga St., Phila., residences. Owner builds. Over $150,000.

Pa., Lock Haven—American Aniline Products, Inc., Dr. T. James, tech. dir. in charge, 2nd story addn. to office, boiler house, etc., separate contracts. **$320,000.** CD 8/25—ENR 8/28, under Industrial Bldgs.

Pa., Phila.—Boardman Smith Corp., 1322 W. Airdrie St., residences, Wellington St. Owner builds. **$200,000.**

Pa., Phila.—W. B. Davenport, 6612 Wayne Ave., residential construction. Owner builds. Est. **$150,000.** D. H. Jenkins, 5116 Oakland St., archt.

Pa., Phila.—Gethel Homes, Inc., 7909 Park Ave., Elkins Park, additional residential development. Owner builds. **$150,000.** E. A. Neale, c/o owner, archt.

Pa., Phila.—Thos. Kelly & Son, 7300 Limekiln Pike, residences, Saul St. Owner builds. **$150,000.**

Pa., Phila.—H. Korman, 6033 Castor Ave., residences, Castor Ave. Owner builds. Over $150,000.

Pa., Phila.—C. J. Mayer, 235 W. Olney Ave., residences. Owner builds. Over **$150,000.**

Pa., Phila.—P. J. and T. P. McFarland, 2409 E. Allegheny Ave., additional residential development. Owner builds. **$150,000.**

Pa., Pittsburgh—Owner, c/o R. Irvin, archt., 605 Starr Bldg., 40 residences, to Home Owners Constr. Co., Starr Bldg. Est. **$220,000.**

Tenn., Humboldt—Proctor Gamble Defense Homes Corp., c/o A. Vitz, Humboldt, general contract 75 one story defense homes, to Algernon Blair, 1st Natl. Bank Bldg., Montgomery, Ala. About **$175,000.**

Wis., Milwaukee—Mother of Good Counsel Catholic Cong., 6825 W. Burleigh St., general contract 2 story, ground floor 103x168 ft., brick, steel, school, to Gebhard-Berghammer, Inc., 5420 W. State St. Bids 8/25. CD 8/19—ENR 8/21.

INDUSTRIAL BUILDINGS

PROPOSED WORK

★**Calif., Burbank**—PLANT—Vega Airplane Corp., plant for manufacture aircraft parts for War Dpt. $1,822,713. Defense Plant Corp. will finance.

★**Calif., Santa Monica**—WAREHOUSE, etc.—Douglas Aircraft Corp., 3000 Ocean Park Blvd., soon lets contract, 20x300 ft. freight warehouse and storage yard, 30x100 ft. office, 24x2,400 ft. storage, near Clover Field Blvd. on Pacific Electric Airline. $500,000. Taylor & Taylor, 803 W. 3 St., Los Angeles, archts. and engrs. CD 8/1—ENR 8/7.

Conn., Meriden—GARAGE, etc.—Connecticut Co., 127 Pratt St., soon lets contract, brick, steel, concrete bus garage and office. Over $40,000.

Ga., Atlanta—PIPE LINE TERMINAL—Pure Oil Co., 140 Spring St. S. W., Gulf Oil Co., Hurt Bldg., and Southeastern Pipe Line Co., Forsyth Bldg., Atlanta, pipe line terminal, Bolton Rd., office bldg., garages, storage tanks, barracks. $100,000.

Ind., Brookville—MILL—Williams Felt & Paper Co., Canal St., mill addns., alterations. $75,000 or more with equip.

Ind., Kokomo—PLANT—Standard Packing Co., Kokomo, rebuilding packing plant, destroyed by fire $60,000 or more with equip.

Ia., Waterloo—FACTORY, etc.—Rath Packing Co., soon lets contract, 5 story, brick, rein.-con., beef killing bldg., over $150,000; 6 story, brick, rein.-con., cold storage bldg., over $150,000. Henschen, Everds & Crombie, 59 E. Van Buren St., Chicago, Ill., engr. CD 8/21—ENR 8/28.

Md., Baltimore — FOUNDRY — American Brake Shoe & Foundry Co., 2001 Laurens St., rejected bids July 14, foundry, $350,000. Will readvertise. O. D. Conover, 1740 E. 12 St., Cleveland, O., engr. CD 7/11—ENR 7/17.

★**Mass., Dorchester** — FACTORY — Meisel Press Mfg. Co., Dorchester Ave., brick, steel, factory unit, Dorchester Ave. $900,000-$1,000,000. Cleverdon Varney & Pike, 46 Cornhill St., Boston, engrs.

N. Y., Buffalo—FACTORY—National Aniline & Chemical Co., S. Park Ave., soon lets contract, factory. Over $40,000. CD 8/25—ENR 8/28.

N. Y., Jamestown—PLANT—Beck & Tinkham, archts., Bailey Bldg., soon lets contract, brick, steel, concrete plant addn., for Weber-Knapp Co., 441 Chandler St. $40,000. CD 5/27—ENR 6/5.

N. Y., Niagara Falls—PLANT—U. S. Hoffman Co., A. Connett, mgr., Lamson St., Syracuse, plant addn. $250,000.

N. C., Durham—BUS TERMINAL—Carolina Coach Co., revised plans bus terminal. $75,000-$100,000. Bids 8/25 rejected. J. M. Edwards, Jr., 102 W. Harrett St., Raleigh, archt. CD 8/22—ENR 8/28.

N. C., Kinston—WAREHOUSES—L. B. Jenkins Tobacco Co., Kinston, rebuilding 2 tobacco warehouses, destroyed by fire. Approx. $125,-000 damage.

O., Paulding—FACTORY—Smith Mfg. Co., Los Angeles, Calif., 3 unit, asbestos brake lining factory. $100,000.

S. D., Sioux Falls—STORAGE—John Morrell & Co., Ottumwa, Ia., 8 story, 60x120 ft. supply storage building. Over $100,000.

Tex., Barker—RECYCLING PLANT—Christian-Carpenter Drilling Co., c/o Mg. Pet. Bldg., Houston, recycling plant, Joyce-Richardson Fields. $175,000.

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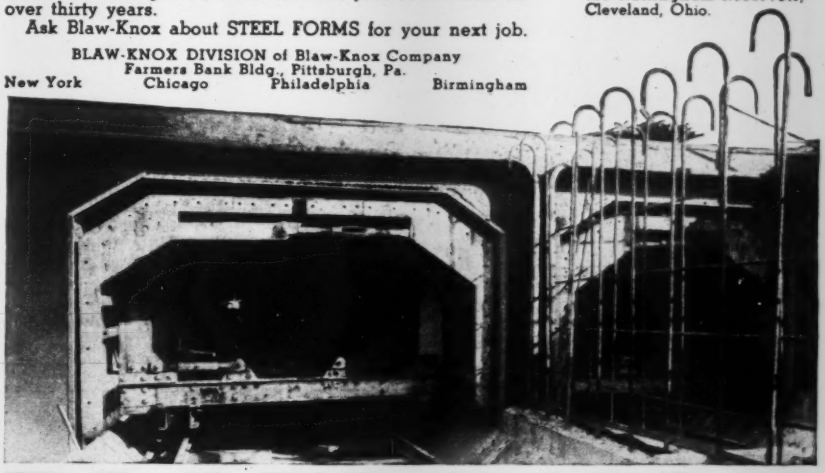

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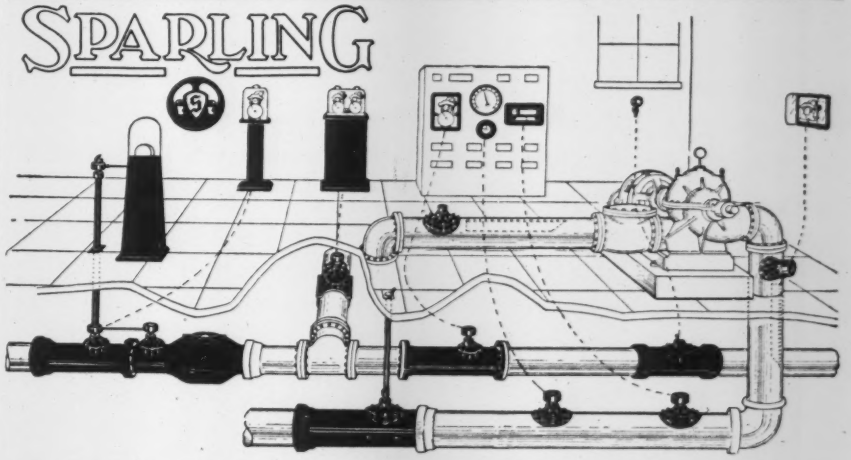

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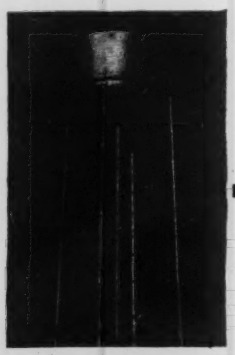

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INDUSTRIAL BLDGS. (Proposed Work, Con.)

★**Tex., Gilmer** — GENERATING PLANT — Farmers Electric Generating Co-operative, c/o H. P. McGaughy, pres., soon lets contract, natural gas generating units. $550,000. Extended date. Freese & Nichols, 407 Capps Bldg., Fort Worth, engrs. CD 8/28—ENR 9/4.

Tex., Houston — WAREHOUSE — Gillette Motor Transport, Inc., 1809-17 N. Houston St., warehouse, $100,000.

Tex., Nederland—PLANT—Humble Oil & Refining Co., Humble Bldg., Houston, pressure maintenance plant, Lovell Lake Field area. $400,000.

Wis., Milwaukee—FACTORIES—A. O. Smith Corp., 3533 W. 27 St., soon lets contract, foundations for 1 story, 300x400 ft., 1 story, 200x600 ft., brick, steel factories. E. W. Burgess, c/o owner, engr. Structural steel, to Wisconsin Bridge & Iron Co., 5023 W. 35 St.

Wis., Whitehall—MILK PLANT — Creamery Co-operatives, c/o P. J. Speerstra, Whitehall, co-operative milk plant. $200,000.

Ont., Hamilton—PLANT—Hutton & Souter, archts., 36 James St. S., soon lets contract, 2 story, rein.-con., bsmnt., steel, brick plant addn., for Aerovox Canada, Canada, Ltd., 35 Catherine St. S. $125,000.

BIDS ASKED

Bids Asked About September 15

Md., Baltimore — GARAGE, etc. — George Transfer Co., 1731 Russell St., 1 story, 50x100 ft. brick, steel, garages, concrete fdn. $50,000. CD 6/13—ENR 6/26.

R. I., Providence—POWER PLANT—Nicholson File Co., 23 Acorn St., 1 story, 50x120 ft., brick, steel, concrete power plant, Acorn St. $50,000. Jenks & Ballou, 2600 Industrial Trust Bldg., engr. CD 9/3—ENR 9/11.

Bids Asked

Conn., Waterbury—FREIGHT TERMINAL, etc.—Coordinated Terminal, Inc., c/o L. F. Caproni, 1221 Chapel St., New Haven (selected list bidders), brick, steel, concrete freight terminal and garage, E. Aurora St. $40,000.

Ill., Chicago—CHIP and OIL HOUSE—Studebaker Corp., South Bend, Ind., 1 story, part bsmnt., 71x172 ft., brick, steel, rein.-con. chip and oil house. $55,000. Giffels & Vallet, 1000 Marquette Bldg., Detroit, enrgs.

Ill., Elgin—FACTORY—Chicago Metal Hose Co., 1315 S. 3 St., Maywood, factory. $40,000. Engineering Systems, 221 N. La Salle St., Chicago, Ill., engrs.

Ind., Fort Wayne — PLANT — Studebaker Corp., South Bend, Ind., 1 story, part bsmnt., brick, steel, rein.-con., chip and oil house. $55,000. Giffels & Vallet, 1000 Marquette Bldg., Detroit, Mich., engrs.

N. J., Linden — FACTORY — Virginia Dare Extract Co., 882 3 Ave., Brooklyn, N. Y., 2½ story, bsmnt., brick, steel factory, Route 5. $150,000. J. J. Closter, 303 W. 42 St., New York, N. Y., archt. CD 8/25—ENR 8/28.

N. Y., Newark—PLANT—Hallagan Mfg. Co., Hoffman St., 1 and 2 story plant addn. $40,000. S. Firestone & E. Lorscheider, Archts. & Engineers Assoc., 59 South Ave., Rochester, archts. and engrs.

Pa., Erie — PLANT — Hammermill Paper Co., E. Lake Rd., A. Goodrich, ch. engr., bsmnt., 40x50 ft., brick, steel, boiler plant addn. Over $40,000. O. C. Schoenwerk, 3420 N. Lake Shore Dr., Chicago, Ill., consult. engr. CD 8/21—ENR 8/28.

Pa., Phila.—PLANT—Keystone Wool Pullers, Orchard and Van Dyke Sts., 2 story, 78x88 ft. plant. $40,000. E. A. Roth, 2248 Bryn Mawr Ave., Bryn Mawr, archt.

Ont., London—FACTORY—A. H. McPhail, archt., Canada Bldg., Windsor, 1 story, 50x150 ft., structural steel, concrete block factory, concrete fdn., N. London St. for owner, c/o architect.

Que., Ville La Salle — PLANT — Spence, Mathias & Burge, archts., 2063 Union Ave., Montreal, exten. dominion works of Canadian Car & Fdry. Co., Ltd., 621 Craig St. W., Montreal. About $150,000.

CONTRACTS AWARDED

Ala., Birmingham—PATTERN SHOP, etc.—American Cast Iron Pipe Co., 2930 N. 16 St., pattern shop and storage bldg., day labor and sub-contracts. **$100,000.**

Ala., Birmingham—DISTRIBUTING PLANT—Wilson & Co., 2 N. 23 St., 2 story, bsmnt., brick, concrete distributing plant, incl. general offices, storage facilities, loading and unloading docks, garage, to Brice Building Co., 215 S. 18 St. Est. **$160,000.** Greer, Holmquist & Chambers, 2401 Montevallo Rd., archts.

Ala., Dadeville—MILK PLANT—Carnation Co., 715 N. Van Buren St., Milwaukee, Wis., evaporated milk mfg. plant, day labor. **$45,000.** R. O. Henzsey, owners' ch. engr.

Ala., Decatur—PLANT — Universal Concrete Pipe Co., Decatur, concrete pipe manufacturing plant, own forces. **$50,000.**

Calif., San Diego — EXPERIMENTAL PLANT—Consolidated Aircraft Corp., 3302 Pacific Hy., 200x325 ft. experimental building to E. F. Bryans, 3401 Granada St. **$130,000.** Bids 8/14—CD 8/11—ENR 8/14.

Calif., San Francisco—DAIRY—G. Christopher, 89-A Shipley St., 1 story, rein.-con. dairy, to J. J. Millet, 100 Citrus Ave., Daly City. **$45,600.** Resing & McGuinness, 488 Pine St., archts. J. J. Gould, Financial Center Bldg., engr.

Calif., San Francisco—MILLING—Grosjean-Callaghan Investment Co., 3230 20 St., 5 story, rein.-con. milling bldg., to Anderson & Ringrose, 320 Market St. **$80,000.** J. M. Smith, 251 Kearny St., engr.

Conn., East Hartford (br. Hart—EN-GINEERING—United Aircraft Co[illegible]ratt & Whitney Div., 2 story engineering addn. and 2 concrete test houses, to Tur[illegible] Constr. Co., 420 Lexington Ave., New Y[illegible] N. Y. Albert Kahn & Associates, 345 [illegible] Center Bldg., Detroit, Mich., engrs.

Idaho, Boise—WAREHOUSE—J[illegible] Deere Plow Co., 100 Blk. 13 Ave., Moline[illegible] gen-eral contract warehouse, to J. O[illegible]dan & Son, S. 25 St., **$112,000.** Tourtellott[illegible]s Hum-mel, Eastman Bldg., archts.

Ill., East Alton—POWER HOUSE—Western Cartridge Co., East Alton, subs[illegible]ucture 1 story, bsmnt., brick, steel, concr[illegible] power house, to United Engineers Constr[illegible]rs, 117 W. Washington St., Chicago; sup[illegible]ucture to Hellrung Constr. Co., Alton. E[illegible] $40,000 plus with equip. Sargent & Lund[illegible] 140 S. Dearborn St., Chicago, engrs.

Ia., Waterloo—TESTING—John D[illegible]e Trac-tor Co., Waterloo, testing departm[illegible]t bldg and raw materials storage bldg. to J[illegible] Olesen & Sons Constr. Co., Waterloo. **$81,675.** Awarded 9/5.

Md., Baltimore — WAREHOUSE — Baugh Chemical Co., 25 S. Calvert St., 1 st[illegible]y, 75x75 ft., 1 story 50x132 ft. and 1 and part 2 story, 50x240 ft., storage warehouses, concrete fdns. to Lumbach & Williams, 30 W. Biddle St. **$75,000.** Bids 8/18. CD 8/15—ENR 8/21.

Md., Relay — COOPERAGE — Calvert Distillery, 3118 Preston St. Rd., Louisville, Ky., 1 story, 50x200 ft., brick, steel cooperage, concrete fdn., to Frantz Constr. Co., 10 W. Chase St., Baltimore. **$75,000.**

Mass., Quincy — WAREHOUSE — Hix-Pearl Corp., 42 Granite St., 2 story, 97x132 ft., brick warehouse, Cliveden St. Owner builds. Est. **$48,000.** M. Waters, 24 School St., Boston, archt.

Mich., Bay City—PLANT—Chevrolet Motor Co., Bay City, 1 story, 221x243 ft. brick, steel, rein.-con. plant addn. to H. C. Weber Const. Co., Bay City. Est. **$250,000.**

Mich., Detroit—BAKERY—Awrey Bakery Co., 5219 Tireman Ave., 3 story, brick, steel, rein.-con. bakery addn., to A. J. Stock Co., 8287 Schaeffer Ave. Est. **$50,000.** CD 8/8—ENR 8/14.

Mich., Detroit—FACTORY—Wall Colmoney Corp., 1067 W. Grand Blvd., 1 story, 60x120 ft., concrete block, steel factory, addn. to chemical plant plain fdn., to Trowell Constr. Co., 1334 Temple Ave. Est. **$45,000.** Malcolmson, Calder & Hammond, Inc., 1217 Griswold St., archts.

Mich., Detroit—GARAGE and SHOP—Michigan Bell Telephone Co., 1365 Cass Ave., 1 story, brick, steel, rein.-con. garage and maintenance shop to Albert A. Albrecht & Co., 1204 Penobscot Bldg. Est. **$40,000.** Smith, Hinchman & Grylls, 800 Marquette Bldg., archts. and engrs.

N. H., Manchester—PLANT—Coca Cola Bottling Co., Inc., Salem Depot, 1 story, 76x124 ft., 2 story, 34x65 ft., brick, steel, concrete, bottling plant, to W. T. Powers, 80 S. Main St., Concord. Est. **$50,000.** Bids 8/22. CD 8/15—ENR 8/21.

N. J., Camden—FACTORY—R. C. A. Victor Co., Front and Cooper Sts., 216x516 ft. factory, to H. K. Ferguson Co., Hanna Bldg., Cleveland, O. Est. **$300,000.** CD 7/30—ENR 8/7.

N. J., Elizabeth—FACTORY—The Linde Air Products Co., Linden Ave. E., brick, steel side addn., altering manufacturing bldg., Linden Ave., to Oschwald Constr. Co., 854 Clinton Ave., Newark. **$40,000.** S. R. Donnellon, 265 E. 42 St., New York, c/o engr.

N. J., Elizabeth—STORAGE—Daniel H. McCarron, 550 Pine St., 1 story, part bsmnt., 100x150 ft., concrete block, stucco storage bldg., separate contracts. **$40,000.** Levy & Pelton, 29 Broad St., archts.

N. J., Garfield—MANUFACTURING—Heyden Chemical Corp., 290 River Rd., 2 story, 40x40ft., brick, steel Manufacturing Bldg. 2 and 1 story, bsmnt. 50x100 ft., brick, steel Manufacturing and Storage Bldg., 32 River Rd., to John J. Steele & Sons, Inc., 48 N. 2 St., Paterson. A. Haenicken, 349 9 Ave., Paterson, archt.

N. J., Hanover—LABORATORY, etc.—Mathie Chemical Co., 240 High St., Newark, 32x90 ft., brick, steel laboratory and manufacturing building, to Sturgis Bros., 22 Gardner St., Morristown. Bids 8/1. CD 7/29—ENR 7/31.

N. J., Hoboken — BEVERAGE PLANT — Galler Beverages, Inc., 129 Grand St., 2 story, bsmnt., concrete block, brick beverage plant addn., to Romagnino Constr. Co., Inc., 275 George Rd., Cliffside Park. **$40,000.** C. F. Dieffenbach, 84 Washington St., archt.

N. J., Maple Shade—FACTORY—E. & W. Twitchell, Inc., Stiles St. and Park Ave., 2 story, 60x122 ft. factory, to Industrial Constructors Co., Broad and Allegheny Aves., Phila., Pa. Est. **$45,000.** L. H. Goettleman, 404 Chestnut St., Brooklawn, archt.

N. J., Newark—MANUFACTURING—G-O-2 Fire Equip. Co., 10 Empire St., 1 story, part bsmnt., 220x440 ft. brick, steel mfg. bldg., Rt. 25, to Wigton-Abbott Corp., 1225 South Ave., Plainfield. **$400,000.** CD 8/28—ENR 9/4.

N. J., South Amboy—SHEDS—Pennsylvania R.R. Co., C. E. Adams, ch. engr., Penna. Sta., New York, N. Y, repairing concrete steel sheds, Main St., to Allied Pneumatic Services, Inc., 345 5 Ave., New York, N. Y. **$40,000.**

N. Y., Niagara Falls—PLANT—National Carbon Co., Inc., Highland Ave., 95x450 ft. and 134x210 ft. plant bldgs., to Serufari Constr. Co., Inc., 825 15 St. Est. **$200,000.** H. T. Reed, c/o owner, engr.

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INDUSTRIAL BLDGS. (Contracts Awarded. Cont'd.)

N. Y., Schenectady—PLANT—General Electric Co., 1 River Rd., 1 story, 240x320 ft., brick, steel turbine diaphragm plant exten., to Turner Constr. Co., 420 Lexington Ave., New York. Chas. T. Main, Inc., 201 Devonshire St., Boston, Mass., engrs.

N. C., Asheville—BUS TERMINAL—Smoky Mountain Stages, 29 Spruce St., Asheville, and Queen City Coach Co., 417 W. 5 St., Charlotte, bus station and repair shop, to Robinson Bros. Constr. Inc., Asheville. **$117,250.** Bids 8/22. CD 4/24—ENR 5/1.

O., Canton—PLANT—Canton Ice & Fuel Co., 1210 3 St. N.E., plant addn., expansion freezing locker facilities, to Schmader Bros., 613 Bedford Ave. N.W. **$40,000.** Awarded 8/16.

O., Columbus—MANUFACTURING PLANT—Clark Grave Vault Co., 275 E. Fifth Ave., steel, frame, shell manufacturing plant, to L. E. Ruisinger, 851 Frebis Ave. Est. **$300,000,** incl. machinery.

Pa., Coatesville — FACTORY — Lukenweld, Inc., Coatesville, 65x177 ft. factory, to Robt. E. Lamb & Son, 843 N. 19 St., Phila. Est. **$50,000.** Day & Zimmerman, Packard Bldg., Phila., engrs. CD 2/14—ENR 2/20.

Pa., Duncannon—FACTORY — Aldon Products Co., 1 story factory, separate contracts. **$40,000.**

Pa., Easton—PLANT—Individual Drinking Cup Co., 24 St. and Dixie Ave., plant addn., to Lauter Constr. Co., Otis Bldg., Phila. Est. **$75,000.**

Pa., Phila.—WAREHOUSE—Atlantic Refining Co., 260 S. Broad St., 70x215 ft. warehouse addn., to Lauter Constr. Co., Otis Bldg. Est. **$40,000.**

Pa., Phila. — PLANT — Cramp Shipbuilding Co., Richmond St., reconstructing plant, destroyed by fire, to Chas. F. Rohleder, 2134 Cherry St. Est. **$60,000.**

Pa., Phila.—STORAGE — Edgewater Dyeing & Finishing Co., Torresdale Ave., 2 story, 80x106 ft. storage bldg., to Leslie E. Bender, Wakeling St. Est. **$40,000.**

Pa., Pittsburgh — MANUFACTURING — Prack & Prack, archts., Martin Bldg., N.S. Pittsburgh, general contract 6 story, bsmnt., brick, steel, concrete manufacturing building, boiler house, for Mine Safety Appliances Co., J. T. Ryan, pres., 300 Braddock Ave., to Navarro Corp., 6219 Broad St. Est. **$80,000.** Bids 8/17. CD 8/12—ENR 8/14.

Pa., Port Allegany—FACTORY—Pittsburgh Corning Glass Corp., L. O. Griffith, plant supt., Port Allegany, general contract brick, steel, glass block, cellular glass mfg. factory, to H. K. Ferguson Co., Hanna Bldg., Cleveland, O. Est. **$150,000.**

Pa., Upper Darby—WAREHOUSE—P. J. Devitt, 69 and Ludlow Sts., 2 story, 65x175 ft. warehouse, to L. Rosengarten, Inc., 3712 Lancaster Ave., Phila. **$45,000.** M. Bernhardt, 215 S. Broad St., Phila., archt.

R. I., Newport—BOTTLING PLANT—Peter Faeber & Sons, Inc., 24 Bath Rd., 2 story, 50x120 ft., brick veneer, concrete block soda bottling plant, to J. J. Sullivan, 20 Pelham St. Est. **$40,000.** C. Dutra, 1 Spring St., archt. CD 8/21—ENR 8/28.

Tex., Edcouch—PLANT—G. O. McDaniel, 101 Adkins St., 1 and 2 story, 128x169 ft., rein.-con., brick packing plant and citrus cannery, force account. **$45,000.** CD 8/14—ENR 8/21.

Tex., Houston — PLANT — Houston Packing Co., 3309 Navigation Blvd., cold storage vaults and new plant unit, to G. Kennedy, 4202 Telephone Rd., **$44,000.** CD 9/2—ENR 9/4.

Vt., St. Johnsbury—PLANT—Coca Cola Bottling Co. of Barre, Inc., 333 N. Main St., Barre, 1 story, 52x86 ft., brick, steel bottling plant, concrete fdn., to A. B. Lane, 38 Highland Ave., Barre. Approx. **$40,000** incl. equip.

Va., Norfolk—TERMINAL—Greyhound Bus Terminal, City Market Bldg., terminal, to W. T. Gregory, Flat Iron Bldg. **$163,222.** A. M. Lublin, Dickson Bldg., archt.

Wash., Tacoma—PLANT—Tacoma Cooperative Plywood Co., 230 East E. St., 210x280 ft. plywood plant addn., to B. Moye, Waller Rd. Est. **$55,000.** CD 7/31—ENR 8/7.

★**Wis., Knowlton** — HYDRO - ELECTRIC PROJECT—Consolidated Water Power & Paper Co., Wisconsin Rapids, hydro-electric project, incl. power plant and dam, etc., owner builds; 345,000 cu. yd. fill to George W. Condon Co., 208 Grain Exch. Bldg., Omaha, Neb.; water turbines, to Jas Leffel & Co., 426 East St., Springfield, O.; generators, etc., to General Electric Co., 1 River Rd., Schenectady, N. Y. Total est. $1,500,000. W. F. Thiele, ch. engr.; and M. V. Molesberry, engr. for equip., Thos. Utegard, engr. for construction, all c/o owner. CD 8/28—ENR 9/4.

Wis., Watertown—BOILER HOUSE—G. B. Lewis Co., 426 Montgomery, 1 story, 35x45 ft., concrete steel, concrete block, boiler house, masonary and carpentery work, to A. Kaddatz, Watertown***structural steel, to O. Biefeld Co., Watertown***new stack, to Nelson Machy. Co., Green Bay.

Wis., Milwaukee—KILN—Kurth Malting Co., S. 43 St. and W. Burnham St., general contract 5 story, 53x115 ft., brick, steel kiln, concrete fdn. to Jezo Constr. Co., 7232 W. Greenfield Ave., West Allis. CD 8/15—ENR 8/21.

★**Ont., Sarnia**—PLANT—Union Gas Co. of Canada, Ltd., 227 N. Front St., Sarnia, S. A. Morse, pres., Hamilton, gas purification plant, river front to Robertson Constr. & Eng. Co., Ltd., Imperial Bank Chambers, Niagara Falls. Est. about **$1,000,000** incl. equip.

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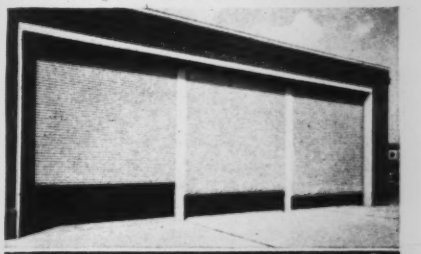

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